21110

NATIONAL LIBRARY
OTTAWA

CANADA

BIBLIOTHÈQUE NATIONALE
OTTAWA

NAME OF AUTHOR... MURRAY FRANK ROBERT SMITH

TITLE OF THESIS.. A PSYCHOLOGICALLY-BASED APPROACH
TO TEACHING SWIMMING.......
....

UNIVERSITY... OF ALBERTA

DEGREE FOR WHICH THESIS WAS PRESENTED... Ph.D.

YEAR THIS DEGREE GRANTED...... 1974

Permission is hereby granted to THE NATIONAL LIBRARY OF CANADA to microfilm this thesis and to lend or sell copies of the film.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(Signed). Murray F R Smith

PERMANENT ADDRESS:

12203-42 A AVE
Edmonton, alberta
....

DATED.. April 30 1974

NL-91 (10-68)

THE UNIVERSITY OF ALBERTA

A PSYCHOLOGICALLY-BASED APPROACH TO TEACHING SWIMMING

by

© Murray Smith

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY
EDMONTON, ALBERTA
SPRING, 1974

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled A Psychologically-Based Approach to Teaching Swimming, submitted by Murray Smith in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Educational Psychology.

Charles C Anderson
Supervisor

J. P. Bowland

External Examiner

Date. March 8, 1974

ABSTRACT

It is apparent that beginner swimming classes are complex environments within which many independent factors interact to influence outcomes. Earlier research by many workers on differential effects of one or two factors provided the bases for improving instruction in many important ways. In contrast, the present study represents an effort to organize, and then apply simultaneously, a large number of current relevant concepts from psychology, motor learning, biomechanics, and studies of teaching style, to the task of teaching non-swimmers.

The study has four major purposes: 1) to organize concepts from the foregoing areas of knowledge into a rationale to serve as a theoretical basis for teaching non-swimmers; 2) to translate that rationale into practical curriculum materials; 3) to videotape classes in which the investigator used the curriculum with classes of children seven to ten years of age, and 4) to investigate the practicability of the system for general use through videotaping similar classes taught by four inexperienced instructor candidates trained in the system.

Videotape from classes was analyzed visually and further a well established system of interaction analysis was used to examine the verbal communication.

Findings revealed that the learning environments based on the curriculum and rationale, were effective in promoting both swimming ability and positive reactions towards water. Examination of data from the analyses provided insights into important educational processes involved.

ACKNOWLEDGEMENTS

There are too many people who helped to hope to be able to thank them all adequately. But I must try. It has been my good fortune to have been associated with many excellent teachers both as a colleague and a student. Their interest and example have been of great value. This is particularly true of Maury Van Vliet and Charles Anderson.

I am indebted to John Bowland, Earl Buxton and Tom Maguire for their able and willing counsel. Juri Daniel provided constructive suggestions which significantly improved the final draft. The professional and human attitudes of the committee resulted in a personal experience for me that was positive and useful in all respects.

Joyce Boorman not only interviewed children and operated the camera in Phase One but made many valuable suggestions. Without her help and the expert technical assistance of Glen Coward the microphones, mixer boxes, tape decks, cameras and lights would have been too much to cope with. Ted Aoki and Pat Browne were generous in their help related to questions regarding aspects of the interaction analysis.

The assistance of Frank Henry in developing the necessary modifications to the ground rules for OSIA and his competent work as an observer put me considerably in his debt.

The children who took part in both phases were beautiful and reminded one of the reason for doing a study of this kind. Parents, teachers, principals and others helped with them in many ways.

Gil Gilmet, friend and colleague, was as helpful in this project as he has always been. The four instructors in Phase Two, Faye Burkholder, Alvina Crossland, Keith Fraser and Wayne Yates, were apt pupils themselves and opened the door to many insights.

In the early phases of the preparation of the manuscript, the assistance of Heather Stroud and Sylvia Popik was invaluable. The perceptive interest in the study, taken by Merle Martin, was matched by her impeccable typing of the final draft.

Finally, the encouragement and support of Rean and our children was not only essential but made it worth doing.

TABLE OF CONTENTS

CHAPTER PAGE

1 INTRODUCTION 1

OVERVIEW 1

PURPOSES OF THE STUDY 3

BACKGROUND OF THE STUDY 4

Prevalence of Swimming 4

A Brief Historical Review of Teaching Methods 7

The Present State 11

NATURE AND ORGANIZATION OF THE STUDY 15

A Conceptual or Critical Inquiry Study 15

Organization of the Study 16

2 THE PSYCHOLOGICAL RATIONALE 18

A FRAMEWORK: BRUNER'S THEORY OF INSTRUCTION . 18

PREDISPOSITIONS TO LEARN 19

Activation 19

Maintenance 25

Direction 26

STRUCTURE AND FORM OF KNOWLEDGE 27

Mode 28

Economy 30

Power 31

Conditions of Practice 33

CHAPTER PAGE

SEQUENCE 40

THE FORM AND PACING OF REINFORCEMENT 43

SUMMARY 47

3 THE DEVELOPMENT OF THE CURRICULUM 49

CURRICULUM AND LEARNING ENVIRONMENTS 49

Curriculum 49

Learning Environments 49

The Rationale as a Source of Guidelines ... 51

CRITICAL CHARACTERISTICS OF THE CURRICULUM .. 51

Predispositions to Learn 51

Structure and Form of Knowledge 53

Sequence 54

Form and Pacing of Reinforcement 55

DEVELOPMENT OF THE CURRICULUM 56

SUMMARY 57

4 RESEARCH QUESTIONS 59

CONSISTENCY BETWEEN RATIONALE AND CURRICULUM 59

CONSISTENCY OF LEARNING ENVIRONMENTS WITH CRITICAL CHARACTERISTICS 60

INTERACTION ANALYSIS 60

Verbal and Nonverbal Communication 60

Interaction Analysis of Actual Instruction 63

CHAPTER PAGE

Hough's OSIA 64

Recording and Displaying Interaction Data Using OSIA 67

The Matrix as a Source of Information About Sequences of Behavior 71

SUMMARY OF RESEARCH QUESTIONS 73

Achievement of Pupils 73

Evidence From Interaction Analysis Matrices 74

Descriptive Analysis 74

Comparisons Between Phases One and Two 75

5 METHODS AND PROCEDURES FOR A PRELIMINARY INVESTIGATION OF THE CURRICULUM 76

OVERVIEW 76

PHASE ONE 77

Subjects 77

Procedures 79

PHASE TWO 86

Decision to Proceed to Phase Two 86

Selection of Trainee Instructors 86

Instructor Training 87

Subjects for Trainee Classes 93

Procedures for Trainee Classes 94

CHAPTER PAGE

THE INTERACTION ANALYSIS 98

Observer Training 98

Selection of Learning Environments to be Analyzed by OSIA 101

Recording, Analysis and Display of OSIA Data 103

Interpretation of Matrices 105

6 RESULTS AND DISCUSSION 108

OVERVIEW 108

PHASE ONE: ACHIEVEMENT OF PUPILS 109

Achievement, Seven and Eight Year-olds, Class 1A 109

Discussion 112

Achievement, Nine and Ten Year-olds, Class 1B 114

Discussion 116

Comparison of Achievement, Classes 1A and 1B 117

REPRESENTATION OF THE CRITICAL CHARACTERISTICS IN THE LEARNING ENVIRONMENTS OF PHASE ONE 119

Critical Characteristic 1.1 120

Critical Characteristic 1.2 126

CHAPTER PAGE

Critical Characteristic 1.3 128

Critical Characteristic 1.4 130

Critical Characteristic 2.1 133

Critical Characteristic 2.2 136

Critical Characteristic 2.3 138

Critical Characteristic 2.4 142

Critical Characteristic 2.5 145

Critical Characteristic 3.1 147

Critical Characteristic 3.2 148

Critical Characteristic 3.3 150

Critical Characteristic 3.4 151

Critical Characteristic 4.1 153

Critical Characteristic 4.2 156

Critical Characteristic 4.3 158

PHASE TWO 162

PHASE TWO: ACHIEVEMENT OF PUPILS 163

Achievement, Seven and Eight Year-olds, Classes 1A and 1B 163

Comparison of Achievement, Seven and Eight Year-olds, Both Phases 166

Achievement, Nine and Ten Year-olds, Classes 2C and 2D 168

Comparison of Achievement, Nine and Ten Year-olds, Both Phases 171

CHAPTER PAGE
THE VIDEOTAPED ENVIRONMENTS OF PHASE TWO ... 173
Interaction Analysis 173
Summary 182
7 CONCLUSIONS AND RECOMMENDATIONS 184
THE RATIONALE AND CURRICULUM 184
EFFICACY OF THE CURRICULUM 185
No Control Group or External Comparisons 185
Phase One Environments 188
Consistency of Environments and Curriculum 189
EFFICACY OF INSTRUCTOR TRAINING 190
Comparison of Environments 190
Achievement of Phase Two Classes 191
SUMMARY 196
IMPLICATIONS FOR FURTHER RESEARCH 206

* * *

REFERENCES 209
APPENDIX A. TEACHING BEGINNING SWIMMING 223
APPENDIX B. TEACHING BEGINNING DIVING 241
APPENDIX C. PROGRESSIONS FOR DEVELOPING THE STANDARD SWIMMING STROKES 246

PAGE

APPENDIX D. TEACHING METHODS FOR SWIMMING INSTRUCTORS 258

APPENDIX E. FLANDERS' INTERACTION ANALYSIS SYSTEM (FIAS) AND GROUND RULES 276

APPENDIX F. HOUGH'S OBSERVATIONAL SYSTEM FOR INSTRUCTIONAL ANALYSIS (OSIA) AND EXTENDED GROUND RULES 280

APPENDIX G. SCHEDULE FOR PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEW 286

APPENDIX H. PHASE ONE: LETTER TO PARENTS 289

APPENDIX I. PHASE TWO: LETTER TO PROSPECTIVE INSTRUCTOR TRAINEES 291

APPENDIX J. LESSON PLANNING GUIDE 293

APPENDIX K. PHASE TWO: INFORMATION TO PARENTS 295

APPENDIX L. OSIA TALLY FORM 298

APPENDIX M. EXCERPTS FROM PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEWS 300

APPENDIX N. OSIA MATRICES, PHASES ONE AND TWO 317

APPENDIX O. OBSERVED HIERARCHY OF INCREASINGLY DIFFICULT BEGINNING SKILLS 338

LIST OF TABLES

TABLE PAGE

1 Type of Instructor Training Activity and Distribution Between Classroom and Pool 91

2 Phase One: Seven and Eight Year-olds, Class 1A, Summary of Information and Final Test Results 110

3 Phase One: Nine and Ten Year-olds, Class 1B, Summary of Information and Final Test Results 115

4 Phase One: Comparisons of Averages for Selected Measures and Average Distances Swum in Final Test, Classes 1A and 1B 118

5 ID Ratios for Analyzed Lesson Environments From Phase One 122

6 Phase One: Combined OSIA Matrix, Classes 1A and 1B, Lessons 1, 2, 5, 7 and 10 124

7 Phase One: Percentages of Category 2 and Category 7 Behavior in Analyzed Lessons 132

8 Phase Two: Seven and Eight Year-olds, Class 2A, Summary of Information and Final Test Results 164

TABLE PAGE

9 Phase Two: Seven and Eight Year-olds, Class 2B, Summary of Information and Final Test Results 165

10 Comparisons of Averages for Selected Measures and Average Distances Swum in Final Test, Classes 1A, 2A, 2B, All Seven and Eight Year-olds 167

11 Phase Two: Nine and Ten Year-olds, Class 2C, Summary of Information and Final Test Results 169

12 Phase Two: Nine and Ten Year-olds, Class 2D, Summary of Information and Final Test Results 170

13 Comparisons of Averages for Selected Measures and Average Distances Swum in Final Test, Classes 1B, 2C, 2D, All Nine and Ten Year-olds 172

14 Phase Two: Combined OSIA Matrix, Classes 2A and 2D, Lessons 1, 5 and 10 174

15 Comparison of OSIA Category Frequencies and Percentages for Combined Matrices, Phase One and Phase Two 175

TABLE PAGE

16 Phase Two: Percentages of Category 2 and Category 7 Behavior in Analyzed Lessons 179

17 ID Ratios for Analyzed Lesson Environments From Phase Two 181

LIST OF FIGURES

FIGURE PAGE

1 Summary of Factors Affecting Motion of a Swimmer (Smith, 1967) 32

2 Comparison of Subdivisions and Categories in Flanders' FIAS and Hough's OSIA (Amidon and Hough, 1967) 66

3 A Sample Matrix of Hough's OSIA (Amidon and Hough, 1967) 70

4 Arrangement of East Pool Teaching Area, Phases One and Two 81

5 Arrangement of West Pool Teaching Area for Deep Water Experience, Phases One and Two . 83

CHAPTER 1

INTRODUCTION

OVERVIEW

Research into the many interrelated aspects of learning has produced a wealth of concepts and formulations that deserve attention. Relevant ideas should be brought to bear in order to make the efforts of the teacher more effective as a facilitator of learning. While each learning task has its own unique characteristics, the task of learning to swim is particularly complex and thus should be illuminated by the application of relevant learning and instructional theory. This has not yet been done to any important degree.

The usual uncertainties are present for the learner of swimming but accentuated by the fact that the activity takes place in an unfamiliar, often threatening, environment. New principles apply. The water at once substantially reduces the effect of gravity, offers great resistance to any movements, and results in rapid and significant loss of body heat. Dry land competencies relative to balance, movement, breath control, vision and hearing are disrupted, often seriously. Some individuals become preoccupied by the prospect of submersion or even of drowning. Others display well defined anxiety reactions in any approach to water. Willingness, and even the capacity, to engage in the risk-taking behavior that is essential if learning is to occur may be significantly reduced as a direct result of the physiological and psychological stresses arising from these conditions.

Despite the complexities of learning to swim, and therefore of teaching swimming, there is a widespread and rapidly growing interest in the activity, at least in the western world. Swimming is also important as a foundation skill in the burgeoning sports that involve activity on, in, or under the water. Finally, one cannot discount the value of swimming ability as a survival skill in the most literal sense and as an activity that may have a strong impact on physical development, physical fitness and the general health of the people.

Thus, an effort to apply available theory to develop more effective methods of instruction is not only of interest and timely from the point of view of the psychology involved but it is a challenge of some social significance.

PURPOSES OF THE STUDY

The present study centers on three major concerns. The first is the development of a psychological rationale to serve as a framework for the construction of a curriculum for teaching children to swim. Both the rationale and the derived curriculum should accommodate, and be consistent with, relevant aspects of modern learning and instructional theory.

The second concern is to test the efficacy of this curriculum with classes of non-swimmer children. Videotaping substantial portions of such classes will facilitate this evaluation and provide a means of checking how consistent the actual instruction is with both the curriculum and rationale. This concern will be focussed on in Phase One of the experimental section of the study.

The third concern of this study is to determine whether the understandings and behaviors required of the teacher for effective use of the curriculum can be acquired readily by freshmen entering the Faculty of Physical Education at the University of Alberta. These individuals are reasonably typical of the virtual army of instructors who teach swimming in Canada. Videotape of classes of children being instructed by such trainee teachers (instructors) will be analyzed to assess their effectiveness in applying the curriculum. Investigation of this concern will be designated as Phase Two of the experimental section of the study.

BACKGROUND OF THE STUDY

Prevalence of Swimming

While the origins of swimming are lost in prehistory, the earliest actual evidence of it is in drawings of men swimming found in caves of the Wadi Sori in the Libyan Desert and established as dating back to 9000 B.C. (Torney, 1950, p. 3). Prevalence of the activity from earliest times is apparent from the many references to be found in the literature of the ancient world and reported by various writers (Sinclair and Henry, 1894; Thomas, 1904; Cureton, 1934; Torney, 1950). Indeed, these references substantiate the fact that whenever the environment has provided the conditions man has taken very readily to the water, as an inevitable part of the hunt, warfare, or the pursuit of the opposite sex. This likelihood is strengthened by Margaret Mead's ([1930] 1968, pp. 35-36) description of how virtually all children of the primitive Manus people of New Guinea learned to swim skillfully by the age of five, without instruction, as a natural consequence of group play in shallow water.

In modern times, swimming is enormously popular as recreation but has lost most of its traditional utilitarian value except as a survival skill in cases of submersion usually as a consequence of recreational activity but not infrequently involving those whose work or required travel results in marine accidents.

The great popularity of swimming as recreation points to a new utilitarian role. That role arises from its potential for important contributions to the physical growth and social development of children (La Porte, 1955) as well as for the improvement of fitness and general health of adults (Sport Participaction, 1972).

Since at least the 1930s, swimming has been the most frequently engaged-in outdoor summer sport on this continent (Sharman, 1973, p. 150). An extensive report to the U.S. Congress on projected recreational patterns indicates that before the turn of the century the sport will be more prevalent than even auto driving for pleasure and that many of the seventeen activities included in the analysis either require water or "... are more attractive near water sites" (ORRRC, 1962, p. 4).

In Canada, 753,477 people were enrolled in Red Cross classes in swimming and water safety in 1970 and this number increased to 821,212 in 1971 (Canadian Red Cross Society, 1972). It is not possible to determine national figures for participation in recreational swimming but taking into account registrations in Red Cross classes and recognizing that YM-YWCA, some municipal recreation departments, school programs, and other agencies offer instruction apart from Red Cross, it is reasonable to assume that annually over one million Canadians are enrolled in classes. This is an impressive figure at a time when our total population stands at less than 21 million.

Some insight into the prevalence of swimming may be gained from the fact that 1.6 million participants were admitted to the eight public indoor pools in Edmonton in 1971 compared to 291,000 participants at the five indoor rinks (City of Edmonton, 1971).

Surveys of clients of recreational or educational programs of physical activities regularly place swimming and water sports at the top of their preferences (Fox, 1957; Daughtrey, 1959; Blumenfeld and Remmers, 1965; Abel and Knapp, 1967; Budd, 1972).

Expert opinion parallels client enthusiasm and La Porte (1955, p. 9) indicates that a survey of leading American physical educators rated swimming as the activity that makes the greatest total contribution to the participant. This view is shared by Canadians Van Vliet and Howell (1967, p. 15).

Besides the growing importance of swimming as an activity in its own right and as a foundation skill for all water sports, there is a distinct safety aspect to be considered. Over the last twenty years, at least, drowning has ranked third among causes of accidental death in Canada, accounting for over 1,000 lives lost each year (Canada Safety Council, 1972). Only motor vehicle accidents and falls result in more accidental deaths. There is evidence that public education programs are having a positive influence both in the U.S.A., where the rate per 100,000 dropped from 10.4 in 1913 to 3.7 in 1958 (National Safety Council, 1959), and in Canada which experienced, in a single year, a 9.3 per cent decrease from 1,173 drowning in 1970 to 1,064 in 1971 (Canada Safety Council, 1972).

A Brief Historical Review of Teaching Methods

If all learners could be provided with the ideal learning environment enjoyed by the Manus children as described by Mead ([1930] 1968, pp. 35-36), this study would be unnecessary. These children enjoyed shallow sandy beaches, warm water and air, extended hours of play literally year around, supervision without interference by mothers preoccupied with social or household concerns yet close enough and vigilant enough to help if needed. Under these conditions Manus children acquired swimming skill in a natural way quite comparable to their learning to walk. In the industrialized world, such conditions seldom if ever prevail. As a result there has been a succession of methods or systems of teaching likely beginning even before the earliest recorded reference to organized instruction in Egypt about 2160

B.C. (Torney, 1950).

Excellent reviews of early systems of instruction are available in Thomas (1904), Cureton (1934), Lewellan (1951), and Mayberry (1959).

The modern research literature contains reports of studies of a variety of variables bearing on effectiveness of instruction. The sequence of teaching particular items or strokes (Hanss, 1937; Scott, 1954; Moncrieff, Morford and Howell, 1962), methods of teaching particular skills (Tinker, 1946; Ford, 1958), the effects of using buoyant or other aids, (Marshal, 1957; Wallace, 1960; Brockway, 1961; Kaye, 1965), timing of deep water experience (Nowlin, 1936; Kruger, 1954; Scott, 1954), and the effects of various personality factors (Ruhl, 1950; Peake, 1952; Stephens, 1955; Ribet, 1957; Whiting and Stembridge, 1965; Behrman, 1967). In addition, there is the question of the distribution as to massing and frequency of practice time (Scott, 1954; Niemeyer, 1959; Stull, 1961; Howell *et al.*, 1962) and, finally, an issue that has long been associated with distribution of practice studies in both verbal and motor skill research; the whole-part question. This question has received considerable study and requires some special comment.

In the great majority of these whole-part studies the distinction between the methods is made as Niemeyer (1959) states.

> In the part method ... students practiced the various strokes by first learning the kick, then the arm movements, and next the breathing. After the parts were learned they were combined into the total stroke. The whole method students never practiced parts of a stroke separately but practiced the strokes in their entirety (pp. 122-123).

A transitional method, familiar from verbal learning studies, the progressive-part method, is also common in motor skills investigations. In this mode, " ... the individual practices the first part of a skill ... then a second part ... and then puts both parts together before practicing a third ... which is then combined with the first two parts, and practiced as a whole" (Cratty, 1973, p. 75).

It is clear from a review of methods studies in swimming that whenever a new approach was to be evaluated the design most often compared results from a part approach with those from a whole approach. In some cases comparisons were between part and progressive-part. This is evidently due to the fact that the dominant swimming instructor training agencies, that is to say both American and Canadian Red Cross Societies, and the YMCA in both countries, have traditionally advocated an almost pure part approach in their instructional publications (American Red Cross, 1938, 1968; Canadian Red Cross, 1948, 1963; American YMCA, 1958; Canadian YMCA, 1933, 1968).

In all of the following studies the control group was instructed by American Red Cross procedures (part) while the experimental group received a treatment which was clearly a whole method or progressive-part (Lewellan, 1951; Bro, 1954; Godlasky, 1955; Sharpe, 1957; Sheard, 1959; Niemeyer, 1959; and Holt *et al.*, 1970). These studies consistently report differences in favor of whole or progressive-part methods over part methods. Niemeyer's (1959) findings are typical.

> The swimming results showed that the students in the whole method group learned to swim sooner, farther, and faster than those in the part method group, moreover, they showed better form. A greater percentage of whole method subjects also learned to swim at least one hundred yards. Perhaps the most remarkable difference was in the distance swim. The mean distance for the whole group was 845 yards, while the part group mean was 442 yards. Undoubtedly, better form in the four basic strokes and having learned to swim earlier in the experimental period favorably affected the whole method group's distance swimming ability.
>
> Form (including the perfection of parts) was emphasized in the part method, but the part method group was found to be inferior in form when compared with the whole method group (p. 123).

While Niemeyer's subjects were male university students, Holt *et al.* (1970), reports similar results for college women. Lewellan (1951) who worked with boys and girls seven to nine years of age, found the whole group children averaged 48 feet on a distance swim and 7.8 (on a 12-point scale) for form of stroke, compared to 29 feet and 6.5 for the part group after 21 lessons of 30 minutes each.

The Present State

Oxendine (1972) summarized the present position with respect to whole and part learning of motor skills.

> Research has been overwhelmingly supportive of the concept of whole learning in motor skills. A primary advantage seems to be that when an activity is learned as a total unit, an understanding of the relationship between all parts is insured. On the other hand, when learned by the part method, the total activity may be viewed as a series of disjointed or unrelated parts. Consequently, additional practice time is required for the purpose of tying together or blending the parts in the mind and the behavior of the learner (p. 189).

James Counsilman of the University of Indiana, a world leader in the theory of swimming has written strongly in support of this principle (Counsilman, 1968, p. 171) as have Cratty (1967, p. 274) and Lawther (1968, pp. 96-97).

Despite this agreement, one is hard-pressed to find examples of instructional systems which are clearly whole approaches. The most noteworthy exception is the Iowa all-stroke method (Armbruster, Allen and Harlan, 1958) which begins with a series of conventional part-method items but, once stroking starts, the procedures clearly require whole-type activities. A second exception is the so-called hand-foot concept developed more than twenty years ago but only recently published (Silvia, 1970). However, neither of these methods has received wide attention and the most recent instructional publications of the American National Red Cross (1968), the Canadian National Red Cross (1963), the

American YMCA (1972) and the Canadian YMCA (1968), still rely primarily on part methods. This is also true of three publications on teaching swimming which are receiving wide acceptance on this continent and elsewhere (Mackenzie and Spears, 1963; Harris, 1965; Morris, 1969).

In summary, it is clear that virtually all current publications in common use fail to account for the demonstrated superiority of whole approaches to teaching swimming. It is also a fact that a substantial body of other relevant aspects of current learning and instructional theory has been neglected in these publications.

The following theories or approaches to the representation of behavior have provided valuable hints in the construction of a new method of teaching swimming. These representations may be grouped into three convenient but not independent categories.

1. The Acquisition of Skill and Concepts. Learning to swim may be defined as the acquisition of particular motor skills and related concepts. In this connection, the shaping of complex behavior and associated reinforcement procedures have been examined by such workers as Skinner (1953, 1965a), Holding (1965), Gagne (1965), and Rushall (1967). Account should also be taken of the role of social learning (modeling) in complex skill learning (Bandura, 1965a, 1969, 1971). Fitts and Posner (1967) have conceptualized three phases in motor skill learning while Fleishman

and his co-workers (Fleishman and Hempel, 1954; Fleishman and Fruchter, 1965) have examined the shifts in relative importance of various factors as motor learning progresses. Both of the foregoing have relevance in the present study.

Also of considerable importance is the role of feedback in motor skill learning (Bilodeau and Bilodeau, 1961; Fitts and Posner, 1967; Robb, 1968), findings related to the acquisition of concepts (Piaget, 1955; Ausubel, 1966) and provision for presenting relevant physical principles (Mohr and Barrett, 1962; Smith, 1967).

2. *Affect and Motivation*. Particularly in activities where the physical environment may be seen as threatening and inability to perform lower order tasks may prevent progress, the factors of affect and motivation would be of significance. Both of these possibilities are present in the context of this study. Thus, Hebb's (1955) conceptualization of arousal, the work of Ryan (1962), Eysenck (1963a) and Carron (1968) on the effects of arousal on learning and performance, and Schachter and Singer's (1962) findings regarding the possibilities for controlling and labelling arousal are of importance. Bandura (1969) and his co-workers report useful procedures in real-life situations with reference to extinctions of fear reactions. Their work also has clear implications for the prevention of fear reactions.

In relation to motivation, the contributions of a large and varied group of researchers and writers should be accounted for within practical limits. This group includes: Birch and Veroff (1966) in terms of incentive systems; White's (1959) concepts of competence motivation; formulations of risk-taking behavior as Atkinson (1957) and Kagan (1966) have described them; and the writings of Child and Whiting (1949), Church and Camp (1965), Locke (1967, 1968), and Locke and Bryan (1966, 1969) regarding influences on learning and performance of the subject's level of aspiration.

3. Teaching Style and Instructional Cues. This category of relevant aspects of learning and instructional theory includes the contributions of Gage (1965), Flanders (1965), Joyce and Harootunian (1967), and Joyce and Hodges (1966) regarding teaching style and flexibility in style. Characteristics found to be effective in helping relationships will also be of interest (Ginott, 1965; Holt, 1964, 1967; Truax and Carkhuff, 1967).

Useful ideas related to instructional cues and aids (Kaye, 1965; Singer, 1968), questioning (Allen, 1967) and mental practice (Stebbins, 1968; Oxendine, 1968) should also be accounted for to the extent possible.

This is a formidable array. It is not possible to structure learning or instructional episodes so that all of these conceptions are accounted for at all times in all ways. A manageable task however, is to use appropriate concepts from this array of theories and representations of behavior at choice points in planning instruction to make decisions with higher probabilities of success than has often been the case in existing systems of instruction. It also appears possible to arrange matters so that no adopted procedures are obviously inconsistent with the concepts included in the three broad categories above.

NATURE AND ORGANIZATION OF THE STUDY

A Conceptual or Critical Inquiry Study

Price (1966) reports Cowley as distinguishing between factual research and conceptual research on the basis that the former generates understanding of new facts while the latter " ... organizes facts already in hand or critically appraises existing concepts" (Price, 1966, p. 333).

Kerlinger (1969) writing in The Encyclopedia of Educational Research makes a similar distinction between scientific inquiry and critical inquiry in this field.

> ... Like scientific inquiry, critical inquiry is primarily concerned with the relations among phenomena. It is a general rubric that includes almost any kind of scholarly study and investigation. Scientific inquiry is one form of critical inquiry, its most powerful form. An educational investigation can be and should be critical inquiry, but it need not always be scientific inquiry. For example, the efficacy of a curriculum can always be studied by using critical inquiry when scientific inquiry might be impracticable, difficult, or impossible (Kerlinger, 1969, p. 1129).

It is apparent that the present study fits Kerlinger's example as a critical inquiry.

Organization of the Study

Chapter 1 has outlined the purposes of the study, presented relevant background, and indicated broad areas of learning and instructional theory that are inadequately represented in current publications on learning to swim. It has also identified the study as a conceptual or critical inquiry investigation rather than one of scientific inquiry.

In Chapter 2, Bruner's (1966) theory of instruction is utilized as a framework on which current relevant learning and instructional theory is organized into a psychological rationale that will serve as the basis for developing a curriculum for teaching swimming to children.

Chapter 3 consists primarily of a set of sixteen characteristics which summarize the major psychological concepts inherent in the rationale. These characteristics serve as guidelines for the development of the curriculum for teaching swimming to children. As such, the characteristics provide conceptual links between the rationale, the derived curriculum, and the learning environments that result from implementing that curriculum. In addition the characteristics serve as a means to examine the consistency among and between these three major components: theory, curriculum, and learning environments. The materials that comprise the derived curriculum are to be found in Appendices A, B, C and D.

Chapter 4 briefly reviews the verbal interaction analysis system developed by Flanders (1965) and his co-workers as a tool for examining learner-teacher communication. Hough's (1967) modification of Flander's original system is selected for use in the present study because it was developed specifically to examine hypotheses generated from learning theory. Research questions related directly to the critical characteristics are stated.

Chapter 5 contains descriptions of the methods and procedures used in Phase One and Phase Two of the experimental section of the study. Phase One is a preliminary investigation of the efficacy of the curriculum in which the writer instructed two classes of non-swimmer children. Phase Two involved training four student instructors and then having each of them instruct a class of non-swimmer children. Basic data arises from the analysis of substantial portions of actual instruction videotaped during both of these phases, as well as data on achievement of children in the experimental classes.

Chapter 6 contains results and discussion.

Chapter 7 contains conclusions and suggestions for further research.

CHAPTER 2

THE PSYCHOLOGICAL RATIONALE

A FRAMEWORK: BRUNER'S THEORY OF INSTRUCTION

The present discussion is concerned with the development of a psychological rationale for a method of teaching swimming that takes into account the relevant aspects of modern learning and instructional theory. Theories of learning and development may be considered essentially *descriptive* while what is of more concern here is what Bruner (1966, p. 40) has termed a theory of instruction, which is "... prescriptive in the sense that it sets forth rules concerning the most effective way of acquiring knowledge or skill." But a theory of instruction must nonetheless be consistent with the theories of learning and development upon which it rests. Bruner's theory has four major features and these will be followed in developing the rationale: (1) *predisposition to learn*, (2) *structure and form of knowledge*, (3) *sequence*, and (4) *the form and pacing of rewards and punishment* (p. 40).

PREDISPOSITIONS TO LEARN

Activation

Bruner accepts Berlyne's (1960) formulation that the presence of some optimal level of uncertainty is the key to the activation of behavior. The familiar inverted U-shaped curve described by Hebb (1955) and Malmo (1959), relating measures of performance to arousal level (or stress), provides another expression of this principle. Cratty (1967) and Spence and Spence (1966) have reviewed studies that support and extend this relationship. The former states in summary that, "In general, impairment is caused by either failure stress or situationally induced stressors when performing complex tasks" (Cratty, 1967, p. 173). A useful distinction between types of threat stressors was made by Basowitz *et al.* (1955) who identified as separate factors, threat of failure and threat of harm. Both of these stressors are distinct possibilities for beginning swimmers.

Because of the variety of meanings to be found in the literature it will be well to specify the meanings of the terms anxiety, stress, and tension, as those assigned by Cratty (1967, p. 161):

> ... anxiety appears to be a general fear or foreboding, a personality trait marked by a low threshold to stressful events. Stress is an in-

> ternal reaction, an intervening variable between situation and performance, evidenced by a marshalling of resources to meet a threat. Tension, on the other hand, is overt muscular contraction caused by an emotional state or by increased effort.

Eysenck (1963b) has suggested that anxiety is related to neuroticism in terms of the lability of the autonomic nervous system and to introversion in terms of the ease with which fear is conditioned. Whiting and Stembridge (1965), in examining this relationship in English schoolboys 11 to 12 years old, found the non-swimmers in their population to score significantly higher in neuroticism and to be more introverted than swimmers of the same age. Behrman (1968) reports similar findings for non-swimmer college males but Burdeshaw (1971) found no differences in personality factors between swimmer and non-swimmer college females. The findings outlined above lend support to the hypothesis that the major problems in activating non-swimmers is influencing their control of anxiety-produced arousal. Ryan (1962), Eysenck (1963a) and Carron (1968) have demonstrated the harmful effects of excessive external stress on progress in learning difficult motor tasks.

Bruner (1966, p. 42) has pointed to the "... special problem of authority involved in the instructional situation." Authority, in this sense, has to do with the relationship between teacher and pupil that may be described as teaching style. The writer takes the position that, flexible teacher behavior is important but the most appropriate teaching style in working with anxious learners is what Flanders (1965) has termed integrative or indirect. In reporting findings from a major research project on the relationship between teaching style and pupil achievement, Flanders (1969) writes:

> The first association which appears most consistently is that indirectness of the teacher is associated with both achievement and positive pupil attitudes ...
>
> The second association which appears in four out of five of the projects reported in this volume is that flexibility in the proportion of teacher direct and indirect statements is also associated with achievement scores (pp. 146-147).

An indirect teaching style is characterized by acceptance of, and sensitivity to, the learner's feelings, an encouraging manner, non-threatening behavior generally and specifically in the use of humor, and questioning aimed at producing directive feedback to the teacher (Flanders, 1965, p. 20). In fact, the situation in which an anxious learner facing active stressors is required to make responses if learning is to occur, resembles a counselling situation. Bruner (1966, p. 53) states that, "In such cases [a state of high drive and anxiety] instruction verges on a kind of therapy." Further support for Flanders' integrative style may be found in its congruence with the behaviors described by Truax and Carkhuff (1967) as those necessary for successful counselling outcomes: genuineness, nonpossessive warmth, and empathy, what Truax has called the therapeutic triad.

This is not to suggest that the instructor's role is to act as an ongoing therapist to his entire beginner class. Rather, it is to identify the characteristics which must predominate in his behavior in dealing with beginners. The reason for this is that many beginners will experience high and interfering levels of anxiety whether their overt behavior makes it obvious or not. Gage (1965) has also emphasized empathy as an important teacher quality and Ginott (1965) and Holt (1964, 1967) consider it essential in effective communication with children.

The work of Schachter and Singer (1962) also offers important implications for dealing with anxious learners. Their finding, that precisely the same state of physiological arousal may be subjectively labelled as widely differing emotions, depending on the cognitions available to the person, is a critical concept. Thus the alert instructor might help anxious beginners to identify at least part of their state of arousal as excitement or some other positive emotion, or reduce arousal by appropriate use of humor. Swimming instructors, paratroop jumpmasters, and athletic coaches, particularly at top levels of performance where stress is high, commonly use humor to re-label in themselves and their charges, at least part of the interfering arousal they experience. Perhaps equally important is attention to eliminating or attenuating cues that might maintain or heighten arousal beyond the desirable level. Manipulation of arousal levels in these ways may well be one of the most important functions of the teacher or coach dealing with learners or performers in tension-producing situations. Implicit, is the idea that should arousal levels fall below the optimum, then steps should be taken to raise the level.

Since swimming instruction is commonly done in groups, the general activity level, particularly vigorous movement, splashing, and loud noise, might well heighten arousal. For this reason a restrained, controlled, pleasant atmosphere is indicated. Further to the question of social influences, Dimitrovsky (1964) has noted the difficulty experienced by young children in correctly identifying emotional meanings in verbal communications from adults. The suggestion here is that children rely instead on what they observe going on around them, particularly peer reactions, peer-teacher interactions and reinforcement contingencies (Bandura, 1965b).

The findings of Bandura and Menlove (1968) are also relevant. These researchers worked with children fearful of dogs. They found extinction to be promoted vicariously through viewing a variety of peers interacting, non-anxiously, in progressively more intimate filmed situations, with dogs. Viewing a variety of peers was significantly more effective than viewing one child. This modeling effect appears to operate in swimming classes where successful responses by some anxious beginners (submerging face, floating) frequently result in previously inactive peers "having a go" themselves. In fact, it is likely that some anxious learners adopt the strategy of withholding active participation until they have observed consequences to peers arising from attempts to learn. If viewing films is effective in the extinction of fear in this way, then presumably first-hand observation of interaction, within a group with which a learner identifies, would hold at least equal potential for encouraging onlookers of the same age (and suitably clad) to "have a go" too.

This waiting strategy of anxious learners, and later display of no-trial learning, closely resembles performances of children who viewed novel behaviors by models and subsequently reproduced the models' responses, without practice, under positive incentive conditions (Bandura, 1965a). Traditionally, the teacher is more likely to press inactive individuals to "get with it" rather than recognizing the possibility that social learning, that will be displayed later, may be taking place. While teacher pressure is often necessary and useful, the danger is that insensitive teacher pressure will heighten anxiety to, or maintain it at, interfering levels.

The question of selecting an anxiety-provoking task, within which a fearful learner will nevertheless be confident enough to attempt a response, suggests a hierarchy of stimulus situations in the Wolpe (1958) sense. This matter will be discussed under the heading of sequence.

Finally with regard to factors that influence activation of search behavior in swimming is the matter of physical conditions. Water and air temperature, wind velocity, and depth of water are all factors that have a direct bearing on activity levels and the disposition of learners to pay attention and engage in prolonged practice.

Maintenance

Bruner (1966, p. 43) has pointed out that maintenance of search behavior, once activated, requires that the benefits from exploring alternatives must exceed the risks incurred. Applied to swimming instruction this would appear to require maintenance of the warm, integrative, teaching style, in deference to anxious learners, coupled with the presentation of appropriate practice activities. These activities or tasks should be of tolerable difficulty so as to invite response attempts and moreover should provide frequent positive information feedback. Fitts and Posner (1967, p. 28) describe the roles of feedback, or knowledge of results, as those of providing "reward [reinforcement], information [response correcting], and motivation." These roles identify feedback as a key variable in the maintenance of search behavior.

The importance of frequent, meaningful, positive feedback may be partially explained by Atkinson's (1957) theory of risk-taking behavior. The active inquiry, or search behavior, that is essential to learning has a clear risk-taking dimension. Atkinson's formulation that performance levels will be greatest when probability of success on the task in question is about 50/50 has been firmly established and extended to examine effects of goal-setting procedures by numerous researchers including Locke (1967, 1968); Locke and Bryan (1966, 1969); Church and Camp (1965); and Levy (1973). This question will receive further attention in a later section.

Direction

Bruner (1966, p. 44) sees both short-and-long-range aspects to the question of a sense of direction or goal.

> The appropriate direction of exploration depends on two interacting considerations: a sense of the goal of a task and a knowledge of the relevance of tested alternatives to the achievement of the goal. For exploration to have direction, in short, the goal of the task must be known in some approximate fashion, and the testing of alternatives must yield information as to where one stands with respect to it.

This points to selecting tasks, within which learners test alternatives in a "guided discovery" way, or as Bilbrough and Jones (1963, p. 35) have described the "limitation method". These tasks should involve critical principles, which in beginning swimming surely include buoyancy; the importance of the long stretched body shape; and propulsion as expressed in Newton's third law of motion (Smith, 1967). See Figure 1. Testing alternatives related to these principles would then yield not only error information with respect to the degree of success in the task but should generate understanding of the operation of the principles themselves.

Further discussion of the selection, sequence, and structure of appropriate tasks leads to the second major feature of Bruner's model of instruction, the structure and form of knowledge.

STRUCTURE AND FORM OF KNOWLEDGE

The challenge to the teacher, or curriculum planner, in structuring learning experiences is summarized by Bruner (1966, p. 44) in the following now-familiar statement, "Any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in recognizable form." The form in which knowledge is to be presented is considered to have three important dimensions: first, the mode of presentation, which relates to its degree of concreteness - abstractness; second, the economy, which relates to the amount of information that must be held in mind and processed to achieve comprehension; and, third, the power of the knowledge which refers to its value in terms of integrating matters that may otherwise appear unrelated (p. 44). These three dimensions, mode, economy, and power, affect the ability of learners to master knowledge by interacting with maturity factors, preferred learning styles, and the nature of the subject matter.

Mode

Three distinct modes in which knowledge may be represented have been identified. Enactive representation, the most concrete mode, is seen as a set of actions (associated with real objects) appropriate for achieving a certain result. The second mode is iconic representation, a set of summary images that represent the knowledge without defining it fully. Third, and most abstract, is symbolic representation, a set of symbolic propositions together with rules for forming and transforming the propositions (Bruner, 1966, p. 45). The young child is seen as capable only of dealing with the world through manipulation of concrete objects; i.e., enactive representation. Age, combined with appropriate experiences and direction, will lead him to deal with his environment in increasingly abstract ways; i.e., through iconic and symbolic representation. Once a learner is capable of utilizing to some extent the first two or all three of the kinds of representations, he is not restricted to any one of these. Rather he is free to shift back and forth between modes and may even work simultaneously in more than one mode. The modes are thus not to be considered discrete or exclusive but interrelate in a dynamic way as might be expected considering their evolutionary relationship.

Instruction then may be conceptualized as a process of arranging experiences by means of which the learner progresses along a concrete - abstract dimension toward his own end-point: a more or less abstract representation of the structure of the subject matter under study. Representations of knowledge made available to the learner at any given time must be either in the mode in which his own problem solving or search behavior, is going on, or it must be translatable into those terms. The danger recognized by Bruner (1966, p. 53) is that if higher order (iconic or symbolic) representations are all that are available, they may be unusable if the learner is not capable of dealing with knowledge from that domain, in those modes. On the other hand, if knowledge, particularly in new domains, is presented following the enactive - iconic - symbolic sequence, the learner may, through dealing with the knowledge, develop the higher order structures. Once these structures are present, it is considered probable that learners might handle input presented in either or both of the higher modes. This is reminiscent of Ausubel's (1966,

p. 166) reception learning which he describes as a process of concept assimilation made possible by "... the ability to incorporate verbally presented relationships between ideas, that is, the criterial attributes of concepts, into existing cognitive structure." But if the required "cognitive structure" is absent meaningful learning does not occur. This point will be further discussed under the heading of sequence.

The implication for swimming instruction is clear. The conservative approach to developing understanding of the role of the principles of physics upon which support and propulsion in the water depend, will emphasize concrete experience (enactive representation) with those principles. Moreover, instructions as to elements of technique will have to be carefully structured to avoid representations that may be unuseable to learners because they are too abstract.

Economy

The amount of information that must be held in mind and processed to achieve comprehension is a measure of the economy of a representation. In swimming, the physical (mechanical) principles explaining motion in the vertical and horizontal planes may well represent a confusing and uneconomical array for both learner and instructor. An economical representation of these principles may be achieved by grouping relevant concepts under four headings: (1) lifting forces, (2) sinking forces, (3) propulsion, and (4) resistance (Smith, 1967). Each heading includes three or four relatively simple and generally familiar concepts, and moreover, the reciprocal relationships between (1) and (2), and (3) and (4), are made evident as indicated in Figure 1. Barrett and Mohr (1962) offer evidence that meaningful presentation of mechanical principles will enhance achievement in learning to swim.

Power

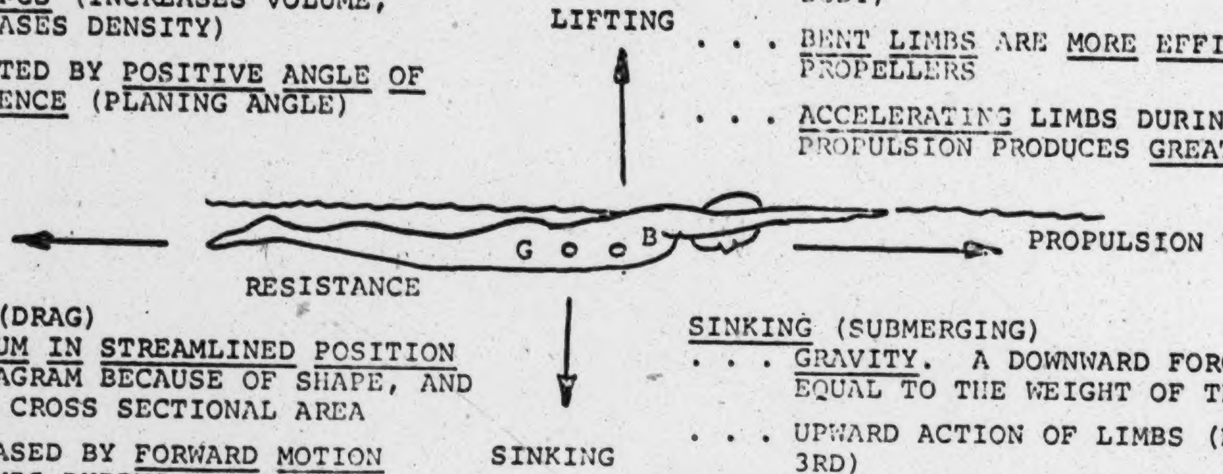
"The effective power of any particular way of structuring a domain of knowledge for a particular learner refers to the generative value of his set of learned propositions" (Bruner, 1966, p. 47). The set of principles referred to in the section immediately above represent the most important "set of propositions" relative to movement in the water (Counsilman, 1968, Chpt. 1). If the learner can be led to grasp a reasonable portion of the implications arising from these principles he will not only progress as a beginner but such understanding should provide access to the "generative value" of these ideas for use in progressing to higher levels of swimming skill. It is on these principles that decisions as to effective technique and efficiency in the strokes and other skills involving movement in the water are based.

LIFTING (SUPPORTING)

- . . . BUOYANCY, AT MAXIMUM WHEN BODY TOTALLY SUBMERGED (ARCHIMEDES' PRINCIPLE)
- . . . DOWNWARD ACTION OF LIMBS (NEWTON'S 3RD)
- . . . ASSISTED BY MAXIMUM INFLATION OF LUNGS (INCREASES VOLUME, DECREASES DENSITY)
- . . . ASSISTED BY POSITIVE ANGLE OF INCIDENCE (PLANING ANGLE)

PROPULSION (THRUST)

- . . . PRODUCED BY LIMBS MOVING WATER BACKWARD (NEWTON'S 3RD) USING LARGEST POSSIBLE PADDLES
- . . . PATH OF HANDS AND FEET IN MOVING WATER SHOULD BE NEAR TO SWIMMER'S LINE OF MOTION (LONG AXIS OF BODY)
- . . . BENT LIMBS ARE MORE EFFICIENT PROPELLERS
- . . . ACCELERATING LIMBS DURING PROPULSION PRODUCES GREATER SPEED



RESISTANCE (DRAG)

- . . . MINIMUM IN STREAMLINED POSITION IN DIAGRAM BECAUSE OF SHAPE, AND LEAST CROSS SECTIONAL AREA
- . . . INCREASED BY FORWARD MOTION OF LIMBS DURING UNDERWATER RECOVERY (NEWTON'S 3RD)
- . . . INCREASED BY ROUGH FABRIC OF SUIT AND BY LOOSE SUIT SCOOPING WATER

SINKING (SUBMERGING)

- . . . GRAVITY. A DOWNWARD FORCE (PULL) EQUAL TO THE WEIGHT OF THE SWIMMER
- . . . UPWARD ACTION OF LIMBS (NEWTON'S 3RD)
- . . . ASSISTED BY DECREASING INFLATION OF LUNGS (DECREASES VOLUME, INCREASES DENSITY)
- . . . ASSISTED BY NEGATIVE ANGLE OF INCIDENCE

KEY: G - Center of gravity. The point at which gravity may be considered to act down on the body.

B - Center of buoyancy. The point at which buoyancy, a force equal to the weight of fluid displaced may be considered to act up on the body. (In women, C of G and C of B are often coincident; in men, the two points are usually several inches apart.)

FIGURE 1 Summary of Factors Affecting Motion of a Swimmer (Smith, 1967)

Conditions of Practice

Because of the uniqueness of swimming as an activity, discussion of some important conditions of practice will be included as an addition to Bruner's theoretical framework. This uniqueness is attributable to the fact that swimming is a particularly complex psychomotor skill, performed in what is for man, an unnatural environment.

Discussion of instruction of complex skills inevitably leads to the question of whole and part learning. Cratty (1967, p. 271) summarizes the present position by noting that "whole" learning is most effective so long as the complexity of the task does not overwhelm (swamp) the learner. Whole learning is almost invariably defined as Cratty (*loc. cit.*) uses the term to mean literally practicing the whole task during each trial. When complexity is too high, a progressive-part method in which parts are chained together as they are learned appears preferable to either a pure part approach (which is seldom encountered in practice but is ever-present in the literature) or to whole learning. These principles add surprisingly little to the work of Pechstein (1917) who was among the first to describe "progressive-part" learning as distinct from part and whole learning. His descriptions would fit well in most modern texts. The kind of gross distinction explicit in defining a whole as the entire complex skill whether it be a relatively simple rotary pursuit task, a maze task, the front crawl stroke, playing in a tennis match, or a full volleyball game, is an understandable beginning point for research. However, if the minimal progress of the past 50 years in relation to part and whole learning is any indication perhaps it is time to look for new approaches to the question. A useful shift away from a gross definition of a whole was made by Seagoe (1936) in identifying a "qualitative whole". Such a whole was considered to have three characteristics:

> (1) It is definitely segregated ... possessing its own characteristic individual entity. (2) It possesses "form-quality", or unity built around a central function ... (3) It is more than a sum of its parts; it is a rational structure (p. 542).

This conceptualization has clearly influenced the definition of a whole in texts on motor learning (Holding, 1965; Cratty, 1967; Oxendine, 1968) but it has not received the attention it deserves in the light of its potential for improving instruction. A notable exception is Holding (1965), who has combined the ideas implicit in a "qualitative whole" with Skinner's (1953) "operant conditioning" to describe skill development by what he terms a method of "gradual metamorphosis" which progresses:

> Just as a child's first attempts at making marks on paper gradually change into the ability to make straight lines or circles, through practice that is not really on the whole skill or any part of it, ...

> In this kind of training the learner is led by short imperceptible steps from what he can do to what he should do, just as ... 'behavior shaping' ... proceeds by successive approximation (Holding, 1965, p. 92).

This method of structuring the learning of psychomotor skills seems consistent with the concept of qualitative wholes as well as being an accurate account of how a good deal of natural learning of physical skills progresses. This is the way a child left to his own devices learns to ride a bicycle, throw a ball, or to swim. To capitalize on this strategy would appear to enlist rich resources in the interests of skill development. It not only employs available heuristics in the learner but at once provides the means for controlling increments of difficulty in the programming sense (Kay, Dodd and Sime, 1968, p. 44) and for manipulating desensitization of learned fear as Bandura (1969) has described it.

This approach to skill development provides the basis for the so-called "movement" approach to elementary school physical education that is currently gaining considerable momentum (Locke, 1969) throughout the world.

Before leaving this discussion it should be emphasized that whatever the limitations of the traditional conception of the whole, the research generally supports the hypothesis that it is more effective than part methods in developing individual psychomotor skills. This is particularly so in swimming as Lewellan's (1951) work with seven to nine year olds, and Niemeyer's (1959) widely cited study using male college freshmen, so vividly indicate.

Despite the foregoing, there remains a useful role for limited part practice in learning complex skills. Gates (1948, p. 347) points to its usefulness in a remedial way to correct a "particular defect or deficiency" of a part. Cratty (1967, p. 272; and Oxendine, 1968, p. 252) note that it may also be advantageous with learners lacking maturity or intelligence. Perhaps this could be re-interpreted to say that less mature or less intelligent learners must deal with less complex "qualitative wholes". Holding's (1965) suggestion of "gradual metamorphosis" through behavior shaping would appear to be hold promise for such learners also.

Consistent also with both a whole emphasis, and shaping, is the concept of environmental practice (Pape and Means, 1963) which refers to attention to practice activity that duplicates as closely as possible the conditions under which the final skill will be performed. This kind of practice would result in maximizing practice while stretched out horizontally, floating freely in the water. This would eliminate much of the land and stationary-supported water drill still advocated and rather widely used and which inevitably leans heavily on the presence of transfer effects. The concept of environmental drill or practice is also congruent with the "identical elements" criterion for maximizing transfer effects (Cratty, 1967, p. 287).

Bandura (1965a, pp. 312-313) argues cogently for the value of social learning, or modeling techniques, in establishing complex behaviors such as skill in swimming. He points out the serious limitations and inefficiencies of relying on operant conditioning as it has been applied in animal research as a means of developing complex responses in humans. The intention in the above description of shaping skill is not that the operant conditioning procedures used with animals will be employed. Rather, through direct modeling, both as planned demonstrations and informal observation of peers by learners, and symbolic modeling, i.e., verbal instructions, prompting, and a variety of visual and auditory cues that the proven efficiencies of social learning techniques will be made available to learners. A remote observer would however witness skill emerge in a manner that could be accurately described as successive approximation, shaping, or gradual metamorphosis. The learning process that is indicated by the present psychological rationale could then be described as a shaping, social-learning process.

The question of distribution of practice time and lesson length will be set aside as not within the scope of the present study. In actual instructional programs these factors are most often controlled by availability of facilities or administrative considerations. The great majority of programs operate within the range of 30 - 45 minute classes meeting anywhere from once weekly to once a day. Two or three half hour classes per week is the usual pattern (Gilmet, 1970).

Class organization and procedures both have important implications for practice. Waiting for turns is still a frequent situation that reflects the military origins of school physical education. Practice should be as continuous as possible with rest periods determined by fatigue or arousal levels rather than the fact that the class "always lines up and waits for their turn". During individual rest periods the possibility that social learning may be going on has already been discussed particularly in relation to early learning. At all stages in learning such periods may also involve physical rest, restoration of emotional control, mental practice, planning, and so on. Freedom for the learner to choose rest times is related to teacher flexibility which is frequently mentioned as a desirable quality (Holt, 1967; Gage, 1965; Joyce and Harootunian, 1967) and has been shown to correlate with teacher effectiveness (Flanders, 1965; Hunt and Joyce, 1967).

With respect to mental practice (covert rehearsal), Stebbins (1968) has reviewed evidence of its value and his own findings add further support.

Brief common rest periods determined by the teacher may be profitably used for demonstrations, error information, questions from learners, or the setting of new tasks. Cratty (1967, p. 59) notes that demonstrations are particularly effective in psychomotor learning. This is not to suggest that all elicited responses should be imitative. Psychomotor learning by the method of "gradual metamorphosis", lends itself extremely well to inclusion of tasks to which a variety of responses will satisfy the objective. This possibility of including elements of discovery learning may well be used to maximize positive knowledge of results (success information) and presumably, gain its motivational benefits. The learner may attack the problem by his own preferred strategies, a factor which Torrance (1965, p. 68) considers to be crucial in many instances.

Present understandings suggest that the common use of complete, complex demonstrations of skilled performances as introductions to new water skills and strokes is of little value and may even be detrimental. In addition to overwhelming learners with many confusing cues, they could be expected to decrease willingness to engage in the risk-taking behavior necessary for learning (Atkinson, 1957). Evidence from studies of modeling would suggest demonstrations of performances at levels within reach of present abilities of learners. Thus they would need to be short, centered on one or two manageable aspects in need of improvement, and would leave the learner optimistic of his chances of replication.

Sequence

> Instruction consists of leading the learner through a sequence of statements and restatements of a problem or body of knowledge that increase the learner's ability to grasp, transform, and transfer what he is learning. In short, the sequence in which a learner encounters material within a domain of knowledge affects the difficulty he will have in achieving mastery (Bruner, 1966, p. 49).

This statement relates to what Bruner (1960, p. 52) has referred to elsewhere as the "spiral curriculum". The question at hand is: where does the spiral begin and how does it progress?

As indicated earlier in this chapter, the conservative sequence in beginning swimming must be structured for the anxious learner. The assumption is that the instructor will be flexible enough to allow confident beginners to progress in a manner more efficient and appropriate for them.

Presumably, the principal source of manifest anxiety is fear of water generally and of submersion of the head specifically. A useful stategy would then be to begin desensitization of such fear using Wolpe's (1958) model of a hierarchy of tension-producing situations. Bandura (1969) and his co-workers have used this model in many successful behavior modification studies involving highly fearful individuals. The technique requires the availability of a group of tasks (stimulus situations) arranged in a general order of increasing anxiety-provoking potential. It must be possible to locate a task, low enough in anxiety potential for a given learner, that the probability of a successful response is close to 50/50. If this is not the case, the learner will withhold response attempts or be incapable of effective responses if he does respond. The initial hierarchy of tasks for non-swimmers would centre around the principle of buoyancy in order to counteract fear of sinking. Progression upwards through these tasks would at once promote desensitization, and enactively develop understanding of how vertical movement in the water is affected.

The spiral would continue by presenting tasks designed to provide experience relative to the awareness of body shape and position while floating. Once the matters of buoyancy and body shape and position were under some control the next turn in the spiral would lead to early attempts at propulsion. Before this, propulsive actions could not be expected to be productive. Early lesson activities would thus involve a variety of tasks, demonstrations, verbal and other cues that visit, and re-visit, the three basic themes of beginning swimming: buoyancy; body shape and position; and, propulsion.

All present systems of instruction begin propulsion by emphasis on leg actions. This is puzzling since it has long been known that the majority of effective thrust is generated by arm actions in most if not all strokes. Counsilman (1949) identified the major role of the leg action in the front crawl as that of stabilizing the body, not propulsion. Later research by Adrian, Singh and Karpovich, reported by Counsilman (1968), established that in the crawl, the arms are over twice as efficient, in an energy utilization sense, as are the legs. In addition, the wrist, hand and arm are capable of infinitely more precision and control in movement patterns than are the ankle, foot and leg. The greater potential for control of movement of the upper limbs is reflected in the larger number of cells in the motor strip of the Rolandic fissure of the cortex of the human brain devoted to the voluntary motor control of these limbs. Penfield and Rasmussen (1957, p. 57) indicate that the linear proportion of this strip devoted to the arms is about twice that devoted to the legs. Proximity of the upper limbs to the eyes is well known to be a crucial factor in skilled movements. For these reasons it appears sensible to focus initial propulsive attempts on the use of the arms rather than the legs.

Further operational decisions as to sequence must be based on intuition and empirical factors because as Bruner has noted, "there is no unique sequence for all learners" (Bruner, 1966, p. 49). But this is not as discouraging a situation as it might first appear since it seems probable that sequence is most critical early in learning experience in a given domain. Once the learner gets his feet wet he may be expected to be increasingly tolerant of various orderings of tasks.

Useful hints as to reasonable sequence of items are available in research findings of Cureton (1934), Scott (1954), Moncrieff *et al.* (1962) and in the various Red Cross and YMCA publications cited earlier.

Another question of sequence relates to the enactive - iconic - symbolic stages of intellectual development discussed earlier. Piaget (1951) considers that one important factor in the frequent failure of formal education arises from the fact that schooling almost always begins at the wrong end of this continuum, with language and illustrations, rather than real action. If this is the case in verbal learning then it presents at least equal dangers in the psychomotor area. Reliance on verbal instruction, especially with young children, would appear highly questionable. The difficulty is that particularly in early psychomotor learning, where Fleishman (Fleishman and Hempel, 1954; Fleishman and Fruchter, 1965) has shown that cognitions related to underlying principles are of greatest importance, these principles must then be learned through structured real experience that leads inductively to comprehension of how things work in the water, rather than being learned verbally.

The Form and Pacing of Reinforcement

> Learning depends upon knowledge of results at a time when and at a place where the knowledge can be used for correction. Instruction increases

> the appropriate timing and placing of corrective knowledge (Bruner, 1966, p. 50).

The trial and error cycles that characterize learning inevitably result in what Bilodeau (1969) has termed "information feedback". Robb (1968) has distinguished between two kinds of feedback: intrinsic or kinesthetic information arising within the body and representing a pooling of kinesthetic and perceptual cues that are natural consequences of movement; and extrinsic feedback arising from artificial cues from the environment such as error reports or evaluative statements.

Bilodeau and Bilodeau (1961, p. 250) have underlined the central role of feedback in motor learning by stating that, "Studies of feedback or knowledge of results ... show it to be the strongest, most important variable controlling performance and learning." Among the many important aspects of this variable are: (1) its temporal relation to the response; (2) its form, whether verbal or nonverbal; (3) whether it is separate for each response or cumulative (Bilodeau, 1969, p. 257). Operationally, the instructor must decide the form and pacing on the basis of their own knowledge of the variable and intuition.

The mechanisms by which information feedback exerts such powerful influences are not fully understood, but "If behavior is goal directed, then the successful approach to the goal [indicated by feedback] can serve to sustain behavior" (Fitts and Posner, 1967, p. 27). Indeed, there is growing support in the literature for the motivational potential of feedback (Smode, 1958; White, 1959; Locke, 1967). The importance of structuring learning to provide positive feedback in this way has been highlighted by Kagan (1966):

> Educators have been guilty of minimizing the critical role which a child's expectancy of failure plays in shaping his behavior in a school situation. The child's motives are contingent on expectation of success or failure, and motives are sloughed or adopted with zeal depending on the degree to which the child believes he can attain the goals that gratify the motive (p. 100).

This statement also suggests the dangers of emphasizing competition with others during the early learning of complex skills. It would seem that a "gradual metamorphosis" approach to skill development would be consistent with both optimizing expectations of success and minimizing excessive competitiveness which is considered to "inhibit the learning process" (Kagan, *loc. cit.*). The emphasis instead should be on personal best performances, on competing with one's own previous best. Bruner (1966, p. 52) points out that feedback will be least useful in a state of high drive and anxiety, since these internal conditions often result in rigid, non-flexible behavior known to be ineffective in problem solving. The matter of anxiety reduction in general has already been discussed.

Cratty (1967, p. 53) and Bruner (1966, p. 53) agree that feedback in the form of instruction is more effective if presented in positive terms, what to do, rather than negative, what not to do. Bilodeau (1969, p. 250) offers the useful observation that "... we now know many circumstances where the needling and cajoling of the subject has no effect upon his behavior." This conclusion, based on laboratory results may point to the importance of cues that have response-directing potential and cues that contribute to positive reinforcement. The mode in which feedback is made available to the learner must be consistent with, or translatable to, the mode(s) in which search behavior is going on.

Providing extrinsic feedback as to the relative success of a particular response is quite straightforward. It can be provided in terms of distance, time, frequency, combinations of these, and qualitative statements. A more difficult challenge is to keep before the learner the relevance of present responses to larger goals. This may be approached, at least in part, if as learning progresses there is awareness of a synthesizing of responses from previous episodes. If early responses are seen as integral and important components of present capabilities, and if the learner, with appropriate direction from the instructor, has a sense of where he started and what his goals are in relation to his present state, one might expect to influence maintenance of motivational effects. This may be part of the mechanism in the shift from reliance on the instructor to a state of more intrinsic motivation which is required if the learner is to assume to himself the corrective function implicit in learning. Kersh (1962) presents evidence that a "guided discovery" approach can be successful in promoting independent activity of the sort one would expect as motivation becomes internalized. Implicit, is the role of the instructor in actively promoting the weaning process, "Otherwise the result of instruction is to create a form of mastery that is contingent upon perpetual presence of the teacher" (Bruner, 1966, p. 53).

SUMMARY

Bruner's (1966) theory of instruction has provided a framework upon which a conceptualization of a modern approach to teaching swimming has been developed. The conceptualization, or rationale, has two ultimate uses. The first is to serve as a basis for accommodating or assimilating current or future research findings which are not already adequately represented. That is to say that some relevant current knowledge may well be missing entirely from the present rationale, while other knowledge that may be inefficiently or ineffectively accounted for is included. The second ultimate use is to provide a tool with which to develop improved learning environments in beginning swimming classes. It is this latter task which is the concern of Chapter 3.

CHAPTER 3

THE DEVELOPMENT OF THE CURRICULUM

CURRICULUM AND LEARNING ENVIRONMENTS

Curriculum

There is little general agreement on the definition of the term curriculum. The best that Taba (1962) could do was to say that it falls somewhere between the extreme of the total effort and environment of the school, on the one hand, and a narrow "... statement of objectives and content outlines ..." (p. 9), on the other.

In the present context, curriculum refers to a set of statements that identify crucial aspects of content, sequence, method, and interpersonal relations; and written material that is designed to provide quite explicit information as to how one combines these elements in the process of teaching.

Learning Environments

As soon as one begins to implement a curriculum in a real teaching situation it becomes appropriate to describe the total situation in a more dynamic way as a learning environment or environments.

Merrill (1971) offered a useful description of this view.

> Schools are established for the express purpose of providing particular kinds of environments where learning outcomes are more likely to occur than in the natural environment. Within a school it is possible to identify two primary kinds of environments. The first consists of the student's interactions with other persons - other students and teachers. It is best characterized as the social environment of the school. Much of what a student learns in school is a result of his interactions within the social environment. The second kind of environment consists of the many stimulus situations designed specifically to bring about a particular learning outcome. This environment consists of lectures, discussions, numerous types of educational media, books, charts, pictures and so forth. These materials have all been selected and arranged in a way thought to facilitate and direct the students' learning experiences in particular directions and frequently for specific behavioral changes. This environment is characterized as the instructional environment of the school. Teachers have a particular responsibility to manipulate both of these environments to make them as effective as possible for their students (pp. 56-57).

While the curriculum in the sense that it has been defined in this chapter cannot fully account for the dynamic dimensions created by the interplay of Merrill's social and instructional environments, it can at least attempt to anticipate important aspects of it. It seems apparent that Bruner's (1966) theory of instruction used as a framework for the rationale developed in Chapter 2, has attempted to do just that.

The Rationale as a Source of Guidelines

The central concern of this chapter is the translation of the psychological rationale developed in Chapter 2 into a curriculum that is at once consistent with underlying theory, and practical as a guide to planning and maintaining learning environments.

The strategy employed was to extract from the rationale a series of concepts which are representative of what the writer chooses to refer to as the critical characteristics. They may also be described as summaries of the important theoretical concepts that are the basis of the approach to teaching swimming being developed here. The process of reducing the rationale to a set of summary statements resulted arbitrarily in the formulation of sixteen of these critical characteristics that provide conceptual links among rationale, curriculum and actual instruction but make no attempt to treat social and instructional aspects as distinct entities.

CRITICAL CHARACTERISTICS OF THE CURRICULUM

1. Predispositions to Learn

1.1 Teacher behavior is flexible but an indirect, warm, style predominates. Warmth towards, and acceptance of, learners is not dependent on status or achievement relative to the group.

1.2 *The learning environment is structured and maintained so that optimal (facilitative) levels of arousal predominate*. This implies both thoughtful planning and sensitive observation by the teacher to assist highly anxious learners to reduce interferring arousal by any combination of: not forcing responses; helping locate less threatening versions of current tasks; attenuating negative emotions, or re-labelling them in partially or wholly positive terms; helping learners accept results of their own best efforts; using proximity, contact, and other behaviors known to reduce anxiety reactions. It also implies attention to confident learners to ensure that sufficiently challenging tasks are available.

1.3 *The tempo of activity is generally continuous and moderate but may be interrupted briefly by decisions of either teacher or learners*. The teacher does so for organizational or instructional reasons, the learner decides when to rest for physical or emotional reasons, or to engage in social learning (modeling), mental practice, planning, or assisting others.

1.4 *Willingness to attempt or risk tasks, either teacher or self-assigned, is met with appropriate positive* verbal or nonverbal reaction, and/or corrective feedback.

2. Structure and Form of Knowledge

2.1 Tasks center around principles that influence human movement in water in both vertical and horizontal planes. Initial representations are in concrete (enactive) terms and if higher order representations are required progression is to iconic and then symbolic terms.

2.2 Practice activities are predominantly in the water (not on deck) and involve "chunks" of movement that the learner identifies as qualitative wholes. Practice of intact segments of strokes or skills is occasionally used in a remedial way.

2.3 Skilled functional movements emerge through a shaping, social-learning process of gradual metamorphosis or successive-modification rather than as a result of the addition of intact parts.

2.4 Learners are free to make significant choices within the general framework established by the teacher. The learner modifies or re-orders tasks and makes decisions, within an appropriate range, regarding practice conditions.

2.5 Demonstrations and other instructional cues are seldom longer than 30 seconds and focus on one or two specific aspects. More often than not, demonstrations are by learners and leave peers optimistic of their chances of replication.

3. Sequence

3.1 Introductory experiences are selected from an empirically established hierarchy of tasks of increasing difficulty or threat to learners. Tasks are arranged under headings in the following order: orientation to the new environment; buoyancy; awareness of various body shapes and positions while floating; propulsion; and water entries.

3.2 Initial propulsive attempts are made while horizontal in the water and involve use of hands and arms in the preferred style of the individual. That is, either simultaneous or alternate arm actions.

3.3 Secondary propulsive experience is focussed on extending personal distance swimming ability and adding a variety of patterns. That is, non-preferred arm action, preferred gentle kicking action with both simultaneous and alternate arm actions, and while in prone or supine body positions. The various styles included in these combinations are described as fundamental swimming as contrasted with standard strokes.

3.4 As distance and versatility improve emphasis is on applying simple formulations of buoyancy, body shape, and propulsion to develop efficiency rather *than on duplicating (imitating) standard swimming strokes or parts of them*. Development of the standard swimming strokes begins when a learner has the ability to swim about twenty-five feet non-stop by one or more versions of fundamental swimming. Such development is also by a shaping, social-learning process.

4. *Form and Pacing of Reinforcement*[1]

4.1 *Reinforcement in the form of positive evaluation or response correcting feedback is offered frequently and specifically in terms of distance, quality, frequency, duration (time), and in various combinations of these factors*. Such feedback is usually provided in close temporal relationship to the relevant performance.

4.2 *Evaluative feedback is in relation to the learner's own past or present achievement levels*. The teacher avoids comparative evaluation between learners other than when using another as an appropriate model. The teacher also avoids comparisons with inappropriate standards.[2]

---

[1] Note that critical characteristics 1.1 and 1.4 above, also deal with reinforcement.

[2] Appropriate in this context refers to a performance within reasonable range of the learner's present state or ability.

4.3 As learning progresses, the teacher stretches the reinforcement schedule and becomes more discriminating in dispensing reinforcers. This is accompanied by a fading of instructional cues and a consequent shift toward more independent activity by the learner.[3]

DEVELOPMENT OF THE CURRICULUM

The curriculum materials were developed, using the sixteen critical characteristics as guidelines to decision-making, under three major areas of activity. These were: (1) beginning swimming, (2) introductory diving, (3) development of the standard swimming strokes. Each area was developed in detail and resulting materials are to be found in Appendices A, B and C.

In any introductory series of swimming lessons, all beginners can be expected to engage in activities from the first two categories above but only those who make uninterrupted progress will spend any significant time on the development of one or more of the standard swimming strokes.

---

[3] Stretching the schedule of reinforcement and fading instructional cues respectively are dealt with in detail by Ferster and Skinner (1957) and Skinner (1968).

Curriculum materials in all three categories include useful aspects and ideas from past and current approaches to swimming instruction and accommodate relevant research findings.

A great many useful ideas, criticism and evaluation of these materials were received in the course of workshops and conferences with active instructors in all parts of Canada over the past six years. Regular activity as an instructor or coach on a continuum of ability levels from non-swimmers on to Olympic class swimmers enabled the writer to test many aspects of the curriculum *in situ* prior to its development in the form in which it was used in this study.

SUMMARY

This chapter has defined curriculum and learning environments and developed sixteen critical characteristics that should be adequately represented in both of these if the present psychological rationale is to provide, in fact, the theoretical background for instruction of non-swimmer children.

The sixteen critical characteristics were used as guidelines to decision-making in preparing detailed curriculum materials.

The next chapter sets out the research questions to be examined. It also outlines the system of interaction analysis that will provide an important means of examining the research questions.

CHAPTER 4

RESEARCH QUESTIONS

CONSISTENCY BETWEEN RATIONALE AND CURRICULUM

The first concern of this study was the development of a mutually consistent psychological rationale and derived curriculum that attempt to accommodate relevant learning and instructional theory in a systematic way. The writer takes the position that the critical characteristics extracted from the rationale and used as specific guidelines in developing the curriculum, have satisfied the consistency requirement between these two components so far as this is possible in the present context.

This is not to say that the present rationale is definitive or the only possible outcome of an effort to organize learning and instructional theory. Further, it is not to say that, given the current rationale, the present curriculum is the only alternative to translating the theory into practical terms. The point is simply that substantial effort and care have been addressed to seeing that this particular attempt has resulted in conceptualizations that represent a defensible position in relation to this concern of the study. These conceptualizations are intended to provide a starting point from which improvement, development, and reconceptualization might proceed.

CONSISTENCY OF LEARNING ENVIRONMENTS WITH CRITICAL CHARACTERISTICS

The next major concern of this study is the question: what evidence is there that the learning environments created by implementing the curriculum are consistent with the critical characteristics that link rationale and curriculum? The strategy adopted to examine this question has two components. First, application to the videotape record of the learning environments of a system of interaction analysis as an analytical tool. Second, a descriptive analysis of the videotaped lessons to examine questions not amenable to interaction analysis.

INTERACTION ANALYSIS

Verbal and Nonverbal Communication

The essence of Merrill's (1971) social environments is to be found in the communication carried on by the people in the environments. Communication between people appears to be synonomous with interaction which has been defined as a relationship between people such that "... the behavior of one is stimulus to the behavior of the other" (English and English, 1958, p. 270: in Whitall and Lewis, 1963, p. 682).

The analysis of classroom interaction (verbal communication) has received considerable attention in the research literature. Applications of available instruments are comprehensively reviewed by Rosenshire (1970). Simon and Boyer (1970) compiled an anthology of interaction instruments which they characterize as tools for describing communication that meet three requirements: these instruments are descriptive as opposed to evaluative, they deal with communication that can be categorized or measured, and they deal with a large number of discrete tallies each of which represents a small "bit" of action or behavior rather than global concepts.

The Flanders' Interaction Analysis System (1965) meets these requirements in that it consists of a system of ten clearly differentiated categories of verbal behavior which can be recorded as tallies representing discrete "bits of behavior" (Appendix E).

The complexity and variability of actual instructional situations produce substantial problems in the face of attempts to record these events with accuracy. The Flanders Interaction Analysis System (FIAS) has been under development and refinement, as one of the more fruitful approaches to these problems, since the mid-fifties. The system is described as:

> ... an observation procedure designed to minimize these difficulties, to permit a systematic record of spontaneous acts, and to scrutinize the process of instruction by taking into account each small bit of interaction (Flanders, 1965, p. 18).

FIAS focuses on analyzing teachers' verbal behavior patterns as they influence the freedom of action of students and the restriction of such freedom. This matter is of central importance to the present study. Flanders, while concentrating on verbal behavior, recognizes that this is only part of classroom interaction.

> Most of the functions associated with teaching are implemented by verbal communication. Of course, nonverbal communication does exist and is not unimportant. The nod of the head to encourage student participation, the finger to the lips to warn against talking, the smile, and the frown, these all communicate to students. But nonverbal communication occurs less frequently than verbal communication and the two are usually highly correlated. The frown is most often associated with statements that express disapproval, the smile with statements of approval (Flanders, 1965, p. 1).

Galloway (1968) offers further justification for primary attention to verbal behavior. He attempted to determine a system for measuring nonverbal behavior and found that the various methods he examined were confounded by verbal interaction analysis. Birdwhistell's (1970) extensive research on nonverbal communication, what he describes as kinesics, suggests that this mode of investigation is at present more suitable for the microscopic, meticulous examination of very brief episodes of behavior as opposed to the macroscopic possibilities of verbal interaction analysis.

Interaction Analysis of Actual Instruction

Rosenshine (1970, p. 279) identified four potential uses of interaction analysis of actual (classroom) instruction: (1) assessing variability in classroom behavior; (2) assessing whether the teacher's performance agrees with specified criteria; (3) describing classroom interaction; and (4) determining relationships between observed classroom behavior and outcome measures.

While both Rosenshine (1970) and Biddle (1967) review research in evaluation of instruction and instruments available for use in classrooms no applications to physical activity are reported. This is not surprising since the former points out that in all subject areas, "Data obtained from direct observation of classroom interaction are seldom collected and analyzed" (Rosenshine, 1970, p. 279). Nevertheless, there has been some attention to analyzing actual instruction in physical education classes. Bookout (1967) studied teacher behavior, but not interaction analysis, in junior high school girls physical education classes using OSCAR, an instrument developed by Medley and Mitzell (1963). Several other studies have been concerned with analysis of various aspects of actual instruction but Dougherty (1970) appears to be the only investigator who has used a modification of Flanders' system in analyzing interaction in physical activity settings. He was concerned with the influence of three different styles of teaching on pupil gains in fitness and motor skills measures.

Anderson (1971; Fishman and Anderson, 1971) and Dougherty (1971) have recently written in support of the application of Flanders' model, or modifications of it, to actual instruction in physical education.

Dougherty (1970) modified Flanders' system by adding a silence category for activity response (meaningful nonverbal activity) and subscripting teacher-talk categories 1-7, to note when the teacher was speaking to individuals rather than the class as a whole.

Hough (1967) presents another modification of Flanders' system which also seems promising, particularly in the present context. The author or co-author of a number of books and technical papers dealing with interaction analysis, Hough has for some years worked closely with one of Flanders' principal associates, Edmund Amidon.

Hough's OSIA

Hough (1967) added six categories to Flanders' (1965) standard ten categories to produce a sixteen-category system referred to as "The Observational System for Instructional Analysis (OSIA)". This system, OSIA, (Appendix F) was designed specifically "... to test instructional hypotheses generated from learning theory" (Hough, 1967, p. 150), and for that reason is of interest in the present study. OSIA uses the same four major subdivisions as Flanders' FIAS as indicated in Figure 2, and these provide for finer discrimination within the original categories to facilitate analyses related to learning theory questions.

> Because the OSIA preserves the social-emotional dimensions of Flanders' (FIAS) system, researchers using either this system or Flanders' system will be able to draw certain types of common conclusions from investigations of classroom verbal behavior done by other researchers.
>
> The major contribution of this system [OSIA] lies in its potential for testing instructional hypotheses derived from learning theory. For example, if separate categories are provided for corrective feedback and for criticism or rejection of student behavior and ideas, the effects of corrective feedback on student learning may be distinguished from the effects of aversive stimulation. ... Provision of [three] separate categories for productive silence as compared with nonfunctional behavior (Flanders' silence and confusion category 10) permits a clear distinction to be made between those behaviors designed to facilitate learning and those which are nonproductive, or at least have no great promise of being productive (Hough, 1967, pp. 150-151).

Of some importance is the fact that Hough has retained the same ground rules as are used in FIAS (Amidon and Flanders, 1967). These ground rules elaborate on the basis for distinguishing between verbal behaviors that are difficult to categorize (Appendix F). This not only facilitates observer training but provides for comparisons between data collected by means of the two instruments.

Because of the close relationship of Hough's OSIA

Major Subdivisions		Flanders' (FIAS) Categories[a]	Hough's (OSIA) Categories[b]
Teacher Talk	Indirect	1 Accepts feelings 2 Praises or encourages 3 Accepts or uses ideas of students 4 Asks questions	1 Affective clarification or acceptance 2 Praise and reward 3 Cognitive and skill clarification and acceptance 4 Teacher questions 5 Response to questions
Teacher Talk	Direct	5 Lecturing 6 Giving directions 7 Criticizing or justifying authority	6 Initiates information or opinion 7 Corrective feedback 8 Requests and commands 9 Criticism and rejection
Student Talk		8 Student-talk response 9 Student-talk initiation	10 Elicited responses 11 Emitted responses 12 Student questions
Silence or Confusion		10 Silence or confusion	13 Directed practice or activity 14 Silence and contemplation 15 Demonstrations 16 Confusion and irrelevant behavior

[a] See Appendix E for a description of FIAS categories.
[b] See Appendix F for a description of OSIA categories.

FIGURE 2

Comparison of Subdivisions and Categories in Flanders' FIAS and Hough's OSIA (Amidon and Hough, 1967) with Flanders' widely accepted system, and particularly because the former has been developed specifically to test theory-based hypotheses, it was selected for use in this investigation.

Recording and Displaying Interaction Data Using OSIA

Recording behaviors. Interaction analysis may be carried out "live" in the classroom or other teaching stations, or it may be done from audio or videotape. The present study utilized videotape. The observer stations himself in front of the video monitor and identifies each "bit" of behavior that takes place by recording the appropriate category number from one to sixteen in OSIA in a column. Tabulation of category numbers is made at the average rate of twenty per minute, or one tally every three seconds. However, if more than one category of behavior is displayed in a three second interval, the category number appropriate for each type of behavior is recorded.

Whenever significant changes in class activity or organization take place, a brief descriptive note is made to indicate the nature of the change. At the end of the observation period, usually at least twenty minutes, and often an entire lesson, the columns of category numbers that represent the events of the lesson or segment are arranged in a matrix of 16 rows by 16 columns. By arbitrary convention, each teaching episode begins and ends with the category number that indicates confusion (16 in OSIA).

Interaction matrices. The category numbers (tallies) are paired from the top of the tabulation and each pair appears as a tally in the corresponding cell in a matrix. Except for the first and last category numbers, each number appears in two successive pairs, first as the second number of a pair, then as the first number of the next pair. The matrix row is indicated by the first number of each pair and the matrix column by the second number in the pair. This procedure preserves some aspects of the sequence of recorded events when the linear tabulations are displayed as a matrix.

Tallies

```
16 x 6 cell (Row 16 ....(16
            (Col  6 ....( 6)   6 x 6 cell (Row 6
 6 x 6 cell (Row  6 ....( 6)              (Col 6
            (Col  6 ....( 6)   6 x 4 cell (Row 6
                          4)              (Col 4
                        (10)
                          2)
                          6
                          .
                          .
                          .
                         16
```

Figure 3 is a sample matrix made up of 290 individual observations and indicates some of the advantages of this type of display. Row and column totals are equal. The percentage of each of the 16 behaviors classified by OSIA appears under the column totals.

Three commonly used ratios are indicated under the matrix. The first is the I/D ratio, which compares teacher use of direct and indirect behavior. It is calculated by dividing the sum of the indirect column totals, columns 1 through 5, by the sum of the direct column totals, columns 6 through 9.

In the same way the ratio of student to teacher talk, S/T, and the ratio of silence to talk, Si/Ta, are computed.

Heavy lines in the matrix mark the boundaries of areas of particular interest. For example, area A consists of the 25 cells contained in rows 1 through 5 from columns 1 through 5 and includes all instances of extended indirect teacher influence. Extended behavior in any category is indicated in the cells that fall along the dotted diagonal. Thus if the teacher extends praise toward a student for 6 seconds this would be indicated by 3 tallies in the 2 x 2 cell since praise is a category 2 behavior. Because cells on the diagonal do indicate extended behavior they are known as "steady state" cells.

Flanders (1970) outlines five steps to matrix interpretation:

1) Check the matrix total in order to estimate the elapsed coding time,
2) Check the percent teacher talk, pupil talk, and silence or confusion and use this information in combination with ...

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	1	1															2
2		3	1	5		1		1			1						12
3		2	13	2		3		2			2						24
4				24						7	2			5			38
5				1	9			1					1				12
6	1			2		[illegible]						1				1	65
7				1			4	1		1							7
8				1				11				1	1	1		1	16
9																	0
10		5	4				3			21							33
11			5							1	18		2				26
12			1		3							9					13
13				1							2	2	17				22
14		1		1						3	1			10			16
15																	0
16						1							1			2	4
T	2	12	24	38	12	65	7	16	0	33	26	13	22	16	0	4	293
%	0.7	4.1	8.2	13.1	4.1	22.4	2.4	5.5	0	11.4	8.9	4.5	7.6	5.6	0	1.4	100

I.D. $\frac{68}{68}$ = [1.00] S.T. $\frac{72}{176}$ = [0.41] S.T.e $\frac{33}{248}$ = [0.15]

FIGURE 3

A Sample Matrix of Hough's OSIA

(Amidon and Hough, 1967, p. 155)

3) ... the balance of teacher response and initiation in contrast with pupil initiation.
4) Check the initial reaction of the teacher to the termination of pupil talk.
5) Check the proportions of tallies to be found in the "content cross"[1] and "steady state cells" in order to estimate the rapidity of exchange, tendency toward sustained talk, and content emphasis (p. 98).

The Matrix as a Source of Information About Sequences of Behavior

Interaction matrices provide a good deal of information about the sequences of behavior that occur in learning environments. Teacher and learner directly influence the behavior of each other. It is not a unilateral situation in which only the teacher's behavior provides stimuli to students.

Teaching style may be illuminated by examining antecedent and subsequent behaviors of both teacher and learner. The convention of entering consecutive pairs of tallies into matrix cells facilitates this. By convention, the first tally of each pair indicates the matrix row, while the second indicates the column. Thus to examine events that precede any given category of behavior, one goes to the column of that category and examines each cell in that column in turn. Figure 3, the sample matrix, shows 12 instances of category 2 behavior, praise and reward. Coming down column 2 it is apparent that what preceded these statements was: 1 instance of affective clarification and acceptance; 3 instances of extended praise; 2 instances of category 3 behavior, cognitive and skill clarification and acceptance; 5 instances of elicited responses by students; and so on.

---

[1] See Amidon and Hough, 1967, p. 133

Similarly, by examining any given row, cell by cell, one can determine the frequencies of behaviors that followed the display of behavior in that category. Row 10 of Figure 3 shows a total of 33 responses elicited from students. The frequency 21 in the 10 x 10, "steady state cell", provides evidence that about two-thirds of these were longer than 3 seconds. Another way of saying this is that in two-thirds of these instances, the initial elicited response was followed by more of the same. The most frequent teacher reactions to elicited responses from the pupil were praise and reward, category 2, which followed in 5 of the 33 instances; cognitive and skill clarification, 4 times; and corrective feedback, category 7, which occurred 3 times.

Such sequential information will be useful in describing learning environments on the basis of interaction analysis matrices.

SUMMARY OF RESEARCH QUESTIONS

The present study was identified in Chapter 1 as one of critical rather than scientific inquiry. It may also be described as exploratory and descriptive. Primary concerns are with consistency among and between rationale, curriculum and learning environments; with evidence of the efficacy of the system in enhancing pupil achievement; and implications for instructor training.

Research questions that guided analysis and interpretation of the data were consequently grouped in four distinct categories related to: (1) achievement of pupils, (2) evidence available from interaction analysis matrices, (3) descriptive analysis of elements of the learning environments not amenable to interaction analysis, and (4) comparisons between data from the two distinct phases of the investigation. Phase one of the present study refers to the two classes of children instructed by the writer. Phase two refers to the selection of four instructor trainees, their training in using the present curriculum, and the classes of children instructed by these trainees.

Achievement of Pupils

What levels of achievement are attained by the classes in both phases of the present study? Are there differences with respect to age or sex? Is there any evidence of influence from I.Q., birth order, socio-economic status of the father, height, or previous water experience as revealed by the pre-lesson interview?

Evidence From Interaction Analysis Matrices

What evidence is available from analysis of the OSIA matrices in both phases of the study, to indicate consistency or lack of consistency between the learning environments and the critical characteristics of the curriculum and rationale?

Of the sixteen critical characteristics that should be given expression in the learning environments, there are seven which should be detectable through examination of the interaction analysis matrices. These are 1.1, 1.2, 1.3, 1.4, 2.5, 4.1 and 4.3. See Chapter 3 for a complete statement of these characteristics.

Descriptive Analysis

The remaining nine critical characteristics of the curriculum and rationale cannot be adequately identified through analysis of interaction matrices assuming that they are represented to some observable degree in the learning environments.

The degree of representation of these characteristics in the learning environments may be evaluated by analysis of relevant episodes from the videotaped lessons.

The research question may then be stated as: what descriptive evidence is there that the remaining nine critical characteristics not listed in the section above, are represented in the learning environments of the two phases of the study?

Comparisons Between Phases One and Two

What do comparisons between results of the two phases of this study reveal?

What implications have these comparisons with regard to the question of training instructors in this approach to teaching swimming?

CHAPTER 5

METHODS AND PROCEDURES FOR A PRELIMINARY INVESTIGATION OF THE CURRICULUM

OVERVIEW

There are three important aspects to the question of the usefulness of the derived curriculum.

First is the question of its general efficacy as an approach to teaching classes of non-swimmer children seven to ten years of age. Does its application produce results that recommend it is a sound conceptualization and operational plan?

If it does appear effective, the second question is raised. Is the approach manageable enough so that the required concepts and behaviors can be acquired with reasonable effort by individuals who appear representative of those who present themselves for instructor training?

The final broad question is concerned with the accuracy of the match between actual instructional environments, the formal curriculum, and the underlying rationale.

Phase one of this preliminary investigation will be addressed to the first question. Phase two will be addressed to the second. The third question will overlay both phases.

PHASE ONE

Subjects

A sample of twenty-four children ranging from seven to ten years of age was selected from pupils enrolled in Queen Alexandra and McKernan elementary schools during the 1970-71 school term. Transportation was to be provided. These schools were close to the university, and the research officer of the Edmonton Public School Board recommended them as including a good cross section of socio-economic status, I.Q., and achievement. The age range of seven to ten years was used because it includes almost two-thirds of the approximately 54,000 Albertans enrolled in learn-to-swim classes leading to Red Cross awards in 1969 (Gilmet, 1970).

Non-swimmers were identified by teachers and arrangements made with the schools and parents to screen the children in the University pool. Candidates were taken singly by the writer, into water three-foot four inches in depth. When about fifteen feet from the entry ladder, each was asked to "Return to the ladder by swimming, or trying to swim, whether you have swum before or not. You may swim any way you like. If you cannot swim, you may walk." Two independent judges, both of whom were experienced swimming instructors, classified the children as non-swimmers provided they did not swim any measurable distance in returning.

A total of 35 non-swimmers identified among the candidates were grouped by age and sex and a final selection of six children in each age/sex category made on the basis of chance. This provided for the formulation of a class of twelve children, six boys and six girls, in the seven and eight age range (Class 1A), and a similar class of boys and girls nine and ten years of age (Class 1B). On the morning of the day classes were to begin one of the six girls in the seven and eight year age group was withdrawn by her mother and no other girl in this category could be located in either of the schools despite vigorous efforts by the writer and both principals. In order not to delay the start of the project a non-swimmer boy in this age group was added. This boy had been screened and identified as a non-swimmer. For this reason Class 1A was made up of five girls and seven boys rather than six of each sex. Class size was set at twelve since this is about the middle of the most popular range of ten to fifteen children per beginner class in Alberta (Gilmet, 1970).

Transportation to the University pool and back to the school was provided by car each Monday, Wednesday and Friday from May 10 to June 1, 1971. Since Monday, May 24 was a civic holiday, the lessons for that day were moved to Tuesday, May 25. This provided for ten lessons of forty minutes each and a final test session.

School cumulative records provided data on grade, age, birth order, I.Q., parental occupation and marital status.

Procedures

Audiotaped interviews. An audiotaped interview was conducted with all twenty-four children before instruction began. The purpose was to gather information regarding the nature and frequency of past experiences, and attitudes towards swimming and water activities. The writer interviewed the boys while a woman experienced in teaching girls of this age interviewed the girls. The interview schedule is contained in Appendix G.

Videotaped lessons. The first four lessons for each class were videotaped in their entirety on half-inch tape using a Sony AVC-3200 camera and a Sony AV-3600 videotape deck. Audio pickup was by two Sony MTL-96, low impedence microphones connected to the AV-3600 deck by means of a mixer box.

Excerpts of about 20-30 minutes of each of the last six lessons for both classes were also taped. This procedure was followed in the interests of economy and to avoid some of the repetitious practice of the later lessons.

Each child wore a tie-on water polo cap with distinct numbers on each side to make it possible to identify individuals during later tape analysis. Important details of the physical arrangements of equipment and the teaching area were as shown in Figure 4.

A restraining rope 25 feet from the end of the pool marked off an area 25 feet by 42 feet in which the lessons were conducted. The two microphones were suspended from a rope over the teaching area so they were located approximately five feet above the water, fourteen feet from each other, and the same distance from either side and from the end of the pool. This arrangement was settled on after considerable experimentation, prior to the actual phase one lessons, with volunteer children from nearby Windsor Park Elementary School. Advice and technical assistance from technicians of the Faculty of Education Audio-Visual Media Centre was invaluable in designing this arrangement which provided for good quality audio-pickup. The location of the camera on the west side of the pool so that it faced away from the deck-to-ceiling windows of the west wall was also decided on their advice and similar experimentation with children from Windsor Park.

To offset the intense light coming through the west windows and the direct light from mercury vapor lamps overhead, three 500-watt stage floodlights were mounted on

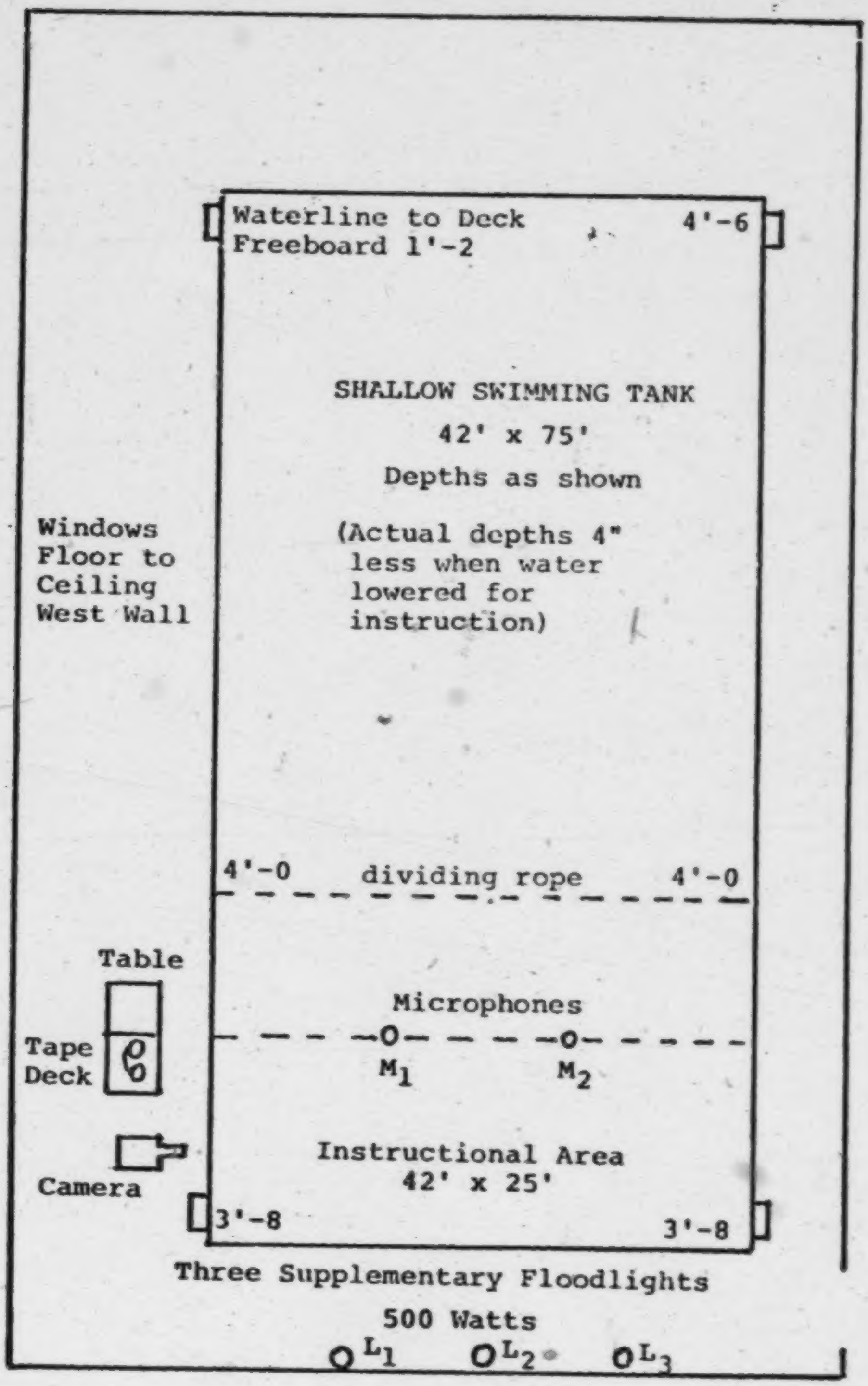

Waterline to Deck
Freeboard 1'-2
4'-6
SHALLOW SWIMMING TANK
42' x 75'
Depths as shown
(Actual depths 4" less when water lowered for instruction)
Windows Floor to Ceiling West Wall
4'-0
dividing rope
4'-0
Table
Microphones
Tape Deck
M1
M2
Camera
Instructional Area
42' x 25'
3'-8
3'-8
Three Supplementary Floodlights
500 Watts
L1
L2
L3

FIGURE 4

Arrangement of East Pool Teaching Area, Phases One and Two the south wall and cross illumination from these noticably improved picture quality.

The camera was operated by the woman staff member (Faculty of Physical Education) who interviewed the girls in these classes. Since the camera could not take in the whole area in focus or with sufficient detail, she used her own discretion in taking a mix of close-up, medium range and long range pictures. It is important to emphasize that because the two overhead microphones were fixed, the sound recording was independent of the particular type of picture being taken at any given moment.

The eighth lesson for both Classes 1A and 1B were conducted in the West Pool in the Physical Education Center in order to have access to deep water. The physical arrangement in relation to the deep arm of the West pool was as shown in Figure 5. The elements were so similar to the arrangement described above in the East (all-shallow) pool that no further explanation need be offered.

Because parents were keenly interested in the progress of their children, they were admitted to the pool area for the last 20 minutes of the sixth and eighth lessons but were seated at the north end of the pool some sixty feet from the teaching area. Following these lessons, the writer had a general discussion with them and answered questions.

Since attendance at lessons was voluntary there

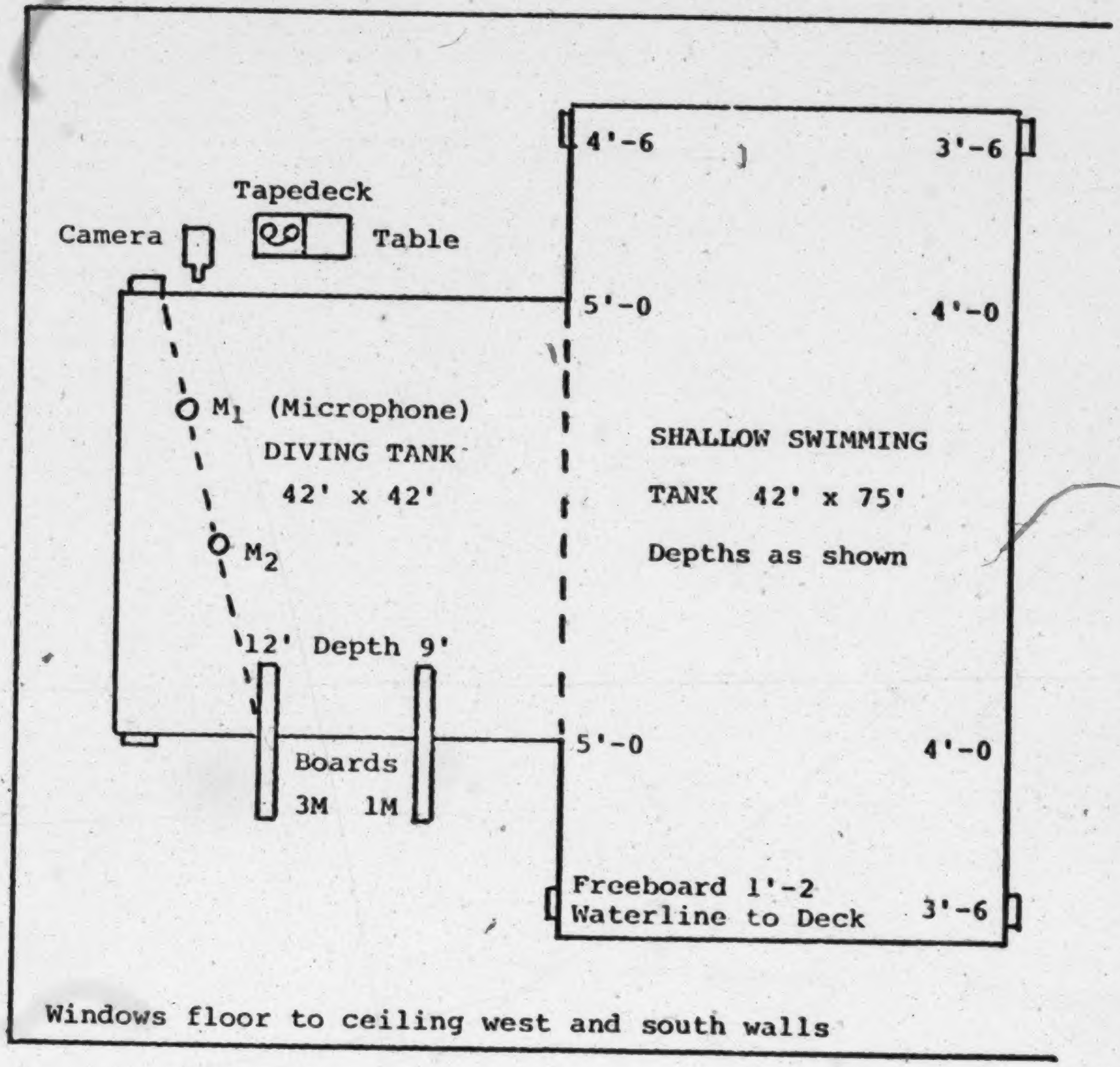

4'-6
3'-6
Tapedeck
Camera
Table
5'-0
4'-0
M1 (Microphone)
DIVING TANK
42' x 42'
M2
SHALLOW SWIMMING
TANK 42' x 75'
Depths as shown
12' Depth 9'
5'-0
4'-0
Boards
3M 1M
Freeboard 1'-2
Waterline to Deck
3'-6
Windows floor to ceiling west and south walls

FIGURE 5

Arrangement of West Pool Teaching Area For Deep Water Experience, Phases One and Two was concern that parents and children be aware of the importance of continuing through the entire set of ten lessons and the test period. To that end a letter stating this concern and reporting general progress of the classes was sent home on May 21, prior to the sixth lesson. An individual note describing progress of each child relative to his or her own entering behavior was hand written on each of these letters. A copy of this form letter is to be found in Appendix H.

Each lesson was planned carefully on the basis of the sequence and teaching suggestions detailed in the curriculum materials. Videotape of previous lessons was not reviewed in connection with lesson planning. Following each lesson, brief notes on stages of progress and particular difficulties were made on the day's plan, for consultation when the next lesson was being planned.

Since the average height of Class 1A was only four foot two and one half inches, and the minimum depth of the East pool is three foot eight inches, the water level on most days was dropped four inches. This factor was not entirely controllable since the pool was being used for many other activities over the duration of the ten lessons and on several occasions the water level had to be raised for other purposes and was not lowered in time for these lessons.

Water temperature was held within the recommended range of 80°F to 82°F while air temperature fell between 84°F to 87°F. This is consistent with the general practice of maintaining a differential of 3°F to 5°F between these two readings, the air temperature being the higher of the two. Relative humidity, as indicated by a wet and dry bulb hygrometer, varied within a few percent of 65 percent.

June 1 test period. Following the tenth lesson, both classes were tested on June 1 during the same time period that the lessons had been held. This session was videotaped without sound. Each child was asked to swim as far as possible, without standing up, in three conditions: (1) face down, (2) on his or her back, and (3) a combination swim in which the child chose to begin either face down or in the back position and, at a time and place of their own choosing, changed to the second body position and continued until he or she could go no farther. A minimum of three minutes rest was required between each of the three items. Distances were recorded to the nearest foot as indicated by the one-foot interval scale clearly marked in the tile on the vertical wall of the pool beginning five inches above the water line.

Each child had one attempt at each item but if the investigator had reason to believe the distance achieved was not adequately representative of the individual's ability, or if the child requested it, he or she was allowed a second attempt. The greater distance of the two was recorded.

Following the test period the children were taken to a nearby park for a picnic supper and returned home by car.

PHASE TWO

Decision to Proceed to Phase Two

Simple observation of results of the testing of Classes 1A and 1B on June 1 indicated several important points. First, that no child dropped out even though attendance was voluntary. Second, all of the children without exception showed substantial increases in confidence in dealing with the water environment. Third, Class 1A averaged 8.1 feet and Class 1B averaged 14.3 feet in the face down distance test. Fourth, with the exception of four children in the younger group, Class 1A, all children were able to swim some distance between 7 feet and 21 feet face down. Fifth, fourteen of the twenty-four children in the two classes were able to cover substantial distances in all three conditions of the test.

These facts led to the decision to proceed to Phase Two of the study to examine the feasibility of training a group of entering freshmen in the approach.

Selection of Trainee Instructors

Three criteria had to be met by trainee instructors: admissibility to the Faculty; reasonable swimming ability, not necessarily indicated by any formal award; and no previous training or experience as a swimming instructor.

In early July, 1971, the writer obtained the names of individuals who had applied for admission to the first year in the Faculty of Physical Education. A letter (Appendix I) was sent to twenty-three of those individuals whose records indicated that they either were acceptable for admission or would likely be so on publication of Grade 12 results, but did not indicate swimming instructor qualifications.

A total of fourteen persons responded and were interviewed by the writer. Several were ruled out because of jobs which did not allow for the required time committment. Others failed to meet one or more of the criteria. Two male and two female freshmen were identified through these interviews who were interested in the project, free to participate and met the other conditions. All four were subsequently admitted to the Faculty.

Instructor Training

The predominant swimming instructor program in Canada is that operated jointly by the Canadian Red Cross and Royal Life Saving Society of Canada. In 1971, a total of 16,734 Canadians qualified for the instructor award in the 40 to 45 hour course required for certification (Canadian Red Cross, 1972). Age statistics are not compiled but the Alberta Director of Red Cross Water Safety Services indicated that about three-quarters were between twenty-one and the minimum seventeen years of age (Gilmet, 1970). Many of them were practicing teachers or undergraduates in either education or physical education.

The manual which details the course content indicates that 18 to 22 of the total 40 to 45 hours of the course deal with matters directly pertaining to approaches to teaching swimming (Canadian Red Cross and Royal Life Saving Society, 1970).

For these reasons it was decided to limit the duration of instructor training in this phase of the present study to this same time range. There is no doubt that the complexity of concepts and required behaviors of instructors are such that much more time could be devoted to this task. However, it was stated in the introduction to this study that if the approach developed here is to be of use it must be readily acquirable by persons reasonably typical of Canadian swimming instructor candidates. The allocation of time to topics directly related to teaching swimming in the combined Red Cross-Royal Life instructor course appeared to be a realistic standard to adopt to test this requirement.

Beginning on July 24, 1971, the writer met with the four trainees on seven separate occasions. The total training time of 19 hours, 45 minutes was divided between

10 hours and 15 minutes in a classroom and 9 hours and 30 minutes in the pool area. Time was distributed between lecture-discussion; viewing videotape and discussion; and practical water work including familiarization with progressions, peer teaching, and micro-teaching with volunteer children.

During the first session each trainee was issued a training folder containing the three papers that are the basis of the curriculum (Appendices A, B, C), a paper by the writer (Smith, 1970), "Teaching Methods for Swimming Instructors" (Appendix D) and a chart, "A Summary of Factors Affecting Motion of a Swimmer", (Smith, 1967) which is Figure 1 of the present study.

The methods paper (Smith, 1970) was written to provide background for the three basic papers of the curriculum. It is a simplified version of the psychological rationale.

The forces chart (Smith, 1967) summarizes the crucial principles of physics that underlie control of movement in the water and are the basis from which much corrective feedback by the instructor is given. The concepts are directly related to the ideas of power and economy as Bruner (1966) has defined them.

The general plan behind the training sessions was consistent with the model described by Hunt (1966). This "... model is primarily applicable to the training of persons such as teachers, psychotherapists, social workers ..." (p. 137), and so on. Hunt uses the term "radiating environments" to describe the training agent's (instructor's) behavior as it impinges upon the person with whom he interacts or instructs. In this sense, the instructor *radiates an environment* through the way the lesson is presented and how he reacts to learners as they engage in activity. "Agent [instructor] effectiveness therefore includes both his *ability* to radiate specific environments and his *understanding* of when to utilize a specific environment or shift to another" (p. 139). The training discussions combined with viewing of taped lessons from Phase One, and practical pool sessions were aimed at developing at least an awareness of this kind of effectiveness.

This process of awareness appeared to be enhanced by the innumerable modeling cues available to the trainees through viewing the tapes. It was further advanced through micro-teaching (Allen, 1967) experience in the pool with each other and with volunteer children prior to the start of actual instruction by the trainees. Table 1 summarizes the training activities and their distribution between classroom and pool.

In addition to the activities summarized in Table 1, the trainees were given reading assignments from the training folder to prepare for coming sessions, to follow-up discussion, and to help prepare micro-lessons.

TABLE 1

Type of Instructor Training Activity and Distribution Between Classroom and Pool

	Classroom Hrs./Mins.		Pool Hrs./Mins.			
Date	Lec. Dis.[a]	Tape Dis.[b]	Lec. Dis.	Tape Dis.	Prac.[c]	Total Time
July						
24	1:00	2:00				3:00
26	0:45	1:00			1:00	2:45
28		1:30			1:15	2:45
29	1:00				1:30*	2:30
30			0:30	1:15**	1:30**	3:15
August						
3	1:30	1:30				3:00
5				1:30	1:00	2:30
Totals	4:15	6:00	0:30	2:45	6:15	19:45

[a] Lecture-Discussion
[b] View Videotape and Discussion
[c] Practical Water Work
* Peer Teaching in Pairs
** Micro-teaching with Children

Trainees were given a supply of "Lesson Planning Guides" and instructed in their use in planning lessons for their own classes. The Guide appears in Appendix J.

A civic holiday on Monday, August 2, necessitated moving the last two training sessions planned for that day and Tuesday, August 3, to August 3 and August 5. Trainees began instructing their own classes on Wednesday, August 4; and on the following day, between the first and second lessons, the final training session, dealing with orienting beginners to deep water and a summary discussion took place.

No formal attempt by way of testing was made to assess the readiness of trainees to begin instruction. Such a procedure is not practical in either the Red Cross-Royal Life course or in university training courses. The typical pattern in university instructor training for physical education majors is a one semester course totalling 38 to 40 hours, as is the case at the University of Alberta, and course content includes several topics in addition to teaching swimming to beginners. While it would have been entirely feasible to design a detailed, elaborate training program for these instructor trainees, it is quite unlikely that such a plan would be adopted by agencies that regularly train instructors.

Subjects for Trainee Classes

Classes instructed by trainees were held during August, 1971, and it was considerably more difficult to assemble suitable classes lacking access to the schools. In order to make the initial instructional experience of the four trainees manageable it was decided that class size would be held at eight children, half of each sex, with two classes seven to eight years of age, and two classes nine to ten. This meant a group of 32 children was required; eight in each age/sex category.

Playground directors were contacted in the university area. Notices were placed in row housing complexes and several radio stations cooperated in broadcasting appeals. Responses were followed up with a letter giving preliminary information (Appendix K). A screening session identical with that held for children in Phase One was arranged and the four required classes were assembled.

The children who met the criteria came from all parts of the city and several were from surrounding rural areas.

In fact, these children met two criteria not required of the Phase One Queen Alexandra and McKernan school children. Rather than being identified by teachers through self-report, the parents of these children enrolled them and also took the responsibility of providing transportation to and from classes. These two factors appeared to be indicative of other important contrasts in the backgrounds of the children in classes in the two phases of the study.

Information as to school attended, grade, age, birth order, parental occupation, and marital status was obtained from parents at the time of screening. Schools attended were contacted for I.Q. at a later date. It was not possible to give attention to including a cross-section of socio-economic status of parents because of the difficulty in locating children and families which could meet all of the criteria and obligations set for the classes.

Despite considerable effort to ensure attendance of all children for each of the ten lessons and the test period, three classes experienced single dropouts. One seven-year-old girl contracted an ear infection after four lessons and was withdrawn on medical advice. A ten-year-old boy was withdrawn when his parents moved to the United States, and an eight-year-old boy left to go on vacation with his family out of the city.

Procedures for Trainee Classes

Audiotaped interviews. Observations made at the screening session indicated that, compared to Phase One children, these children while non-swimmers were generally confident, outgoing and eager to get on with instruction. During registration, parents were asked to indicate any unpleasant experiences or reactions to water on the part of their child. The children were asked the same question. Negative experiences were reported in relation to four of the younger age group children and five of the older group. For this reason, only these nine children were interviewed using the same schedule as had been used with the Phase One children (Appendix G). The writer interviewed the six boys and three girls involved.

Videotaped lessons. Trainees were assigned to classes so that one class of seven and eight year olds was instructed by a male and one by a female. The same was true for the classes of older children.

Assignment of trainees to classes was determined by their personal work schedules since all of them finished their summer day jobs at different times and worked at various locations throughout the city.

The two classes of eight children in the seven to eight age range were designated 2A and 2B. The nine to ten age range classes were designated 2C and 2D.

All four classes were composed of four boys and four girls, in the respective age ranges. Children wore the same type of tie-on water polo hats reported earlier so that identification during tape analysis would be facilitated.

Excerpts averaging 20 to 25 minutes from each of the first four lessons in all four classes were videotaped and this average was lowered to 15 to 20 minutes for the last six lessons in all classes. This practice was followed in the interests of economy and because it was considered that excerpts of these durations would provide adequate material to assess trainee behavior and class interactions. Taping consisted of a balance in between long range, medium and close-up shots. The guiding principle in taking footage was to attempt to include segments that contained presentation of concepts and skills and most practice activity. Periods of repetitive practice with minimal interaction were not filmed. The writer operated the videotaping and sound equipment in all cases.

The trainees' ten lesson units. The ten classes of 40 minutes each were held in the all-shallow East pool on Mondays-Wednesdays-Fridays from August 4 to August 25. The younger age group classes began at 4:15 PM (2A) and 5:00 PM (2B), while the classes for the older children started at 5:45 PM (2C) and 6:30 PM (2D) each day.

Parents brought and picked up children or arranged car pools on their own. Scheduling and annual maintenance shut-down had made it difficult to arrange for deep water experience in the West pool in Phase One but there was no difficulty in this respect for Phase Two classes. Arrangements were made to have all four classes spend lessons six and eight (August 16 and 20) in the West pool for deep water experience.

Parents were admitted to the pool area for the last 20 minutes of lessons five and eight (August 13 and 20).

Following these classes the trainees and writer talked to interested parents and answered questions.

Parental interest was so high that it was not considered necessary to write a letter reminding them of the importance of maintaining attendance throughout the lesson and test period.

During the training period the question of lesson planning was discussed at some length as was the use of the guide for lesson planning, which was directly related to the curriculum. Trainees were asked to write out a daily plan on the planning guide form and to show it to the writer prior to each lesson. This was done and indicated that reasonable time was being spent on this aspect and that materials from the training folder were being used in appropriate ways. After classes began on August 4, there was no further training other than the session dealing with deep-water orientation which had to be delayed until August 5, because two of the trainees were out of the city for the long weekend. There was no discussion of lesson one of the trainees' classes at the final training session on August 5.

Water and air temperatures and relative humidity fell within the ranges reported for Phase One classes.

August 27 test period. Testing procedures were carried out during the regular lesson period. The same data were gathered under the same procedures already reported for Phase One.

THE INTERACTION ANALYSIS

Observer Training

All of the videotape analysis in this study was done by the investigator and a senior graduate student working cooperatively.

The reliability of this pair of observers was established after some thirty hours of training and prior to the actual analysis of videotape. Training procedures were as set down by Flanders (1967). These procedures were considered appropriate since Hough, in developing his OSIA had as his objective a system that paralleled the general organization and category sequence of Flanders' FIAS. "It was hoped that by so doing, positive transfer would be facilitated for those persons who wish to learn to use both systems" (Hough, 1967, p. 150). Figure 4 indicates how close this parallel is and supports the contention that FIAS training procedures are indeed appropriate.

The training of the pair of observers involved the following steps:

1) Both observers memorized the 16 category descriptions and noted the fine distinctions described by Amidon and Flanders (1967, pp. 18-23), and Flanders (1970, pp. 39-53). These distinctions were reconciled with Hough's descriptions and ground rules (1967, pp. 151-154).

2) Typed transcripts of pupil-teacher interaction available from Flanders (1970, pp. 56-67) and Robbins (1973, pp. 181-188) were categorized independently. Tabulations were compared and discrepancies resolved through discussion. Flanders (1967) suggests 6 to 10 hours of training prior to "live" analysis (p. 159). With six additional categories, it was found in this study that 20 hours was required before the categories were under sufficient control by the observers.

3) After 20 hours of preliminary training, the observers spent 5 hours working cooperatively on randomly selected segments of the videotapes from Phase One. This period of the training enabled final distinctions to be made in the specific OSIA ground rules related to the present learning environments (Appendix F). An additional 7 hours at this stage involved alternating between independent tabulation of behaviors in random segments of from 4 to 10 minutes in length and cooperative tabulation. Discrepancies were again resolved by discussion. At this stage, intra-observer reliability checks were made, using Scott's coefficient as recommended by Flanders (1967). The same segment of

videotape was analyzed by the same observer on two separate occasions, at least two hours apart or on successive days. Both observers consistently attained Scott reliability coefficients ranging between 0.87 and 0.92. Flanders (1967) indicates a coefficient of 0.85 as evidence of acceptable reliability.

4) Having arrived at an acceptable level of intra-observer reliability, it remained to establish a satisfactory inter-observer reliability. The two observers independently analyzed the same randomly selected five-minute segments of videotape. Scott's coefficients of reliability between these sets of independent observations were calculated and in the beginning they ranged between 0.75 and 0.82. Disagreement between placing statements in category 6, teacher initiated information and opinion, and category 8, requests and commands, consistently gave rise to the majority of error. Refinement in discrimination between these led to agreement between the two observers that resulted in Scott's coefficients of 0.87 and 0.86 on two different segments. While these values were just barely above Flanders' recommended 0.85, it was considered acceptable since presumably it would be

difficult to attain higher values in view of the 16 categories of OSIA as compared to only 10 categories in FIAS. These training procedures involved a total of 36 hours.

Selection of Learning Environments to be Analyzed by OSIA

Total instruction time for each class in Phase One was 400 minutes, i.e. ten 40-minute lessons. Just over 300 minutes or 75% of the total instructional time for each group was videotaped. Lessons one to four were taped in their entirety, 160 minutes, while about 25 minutes of each of the last 6 lessons were taped, 150 minutes. Five hours of tape was thus available for each of classes 1A and 1B. Flanders (1970, p. 37) indicates that a range of 20 to 25 tallies per minute is usual and emphasizes that a regular tempo is more important than achieving a particular rate. The complexity of the learning environments was such that the tempo in the present study was consistently between 23 and 26 tallies per minute. It was not unusual for three or four different categories of behavior to appear in the space of three to four seconds. Since a total of ten hours of tape of Phase One lessons was available for analysis, and given a rate of 25 tallies per minute, there were approximately 600 minutes times 25 behaviors per minute, or 15,000 bits of behavior available for analysis on the videotape. This total did not by any means represent all the behaviors displayed on the videotape but only those that would be recorded given the limitations of OSIA or any Flanders' type system of interaction analysis.

The investigator considered that an adequate representation of the interaction involved in the environments of Phase One could be obtained through about half of the total videotape available provided the learning episodes to be analyzed were selected logically. It was decided that it would be useful to include all of the first two lessons for both classes 1A and 1B because of the particular problems involved in the orientation of beginners. In addition, videotape from lessons four, seven and ten was analyzed. Lesson eight was excluded because it was held in the West Pool for deep water orientation and sound quality and levels were not adequate for interaction analysis.

Analysis of videotape from lessons one, two, four, seven and ten for classes 1A and 1B yielded a total of 8026 tallies, well above the 6000 tallies Flanders (1970, p. 100) considers adequate to provide a stable sample of a particular teacher's behavior.

The intention was to analyze videotape involving all four instructor trainees from Phase Two. Review of the Phase Two tapes, however, revealed that both of the female trainees spoke so quietly that it was impossible to categorize their talk reliably. The pupils, perhaps partially due to a modeling effect, were also difficult if not impossible to hear a good deal of the time. The two male instructors produced clearly audible recordings and OSIA analysis from Phase Two was of necessity restricted to videotape recordings of their teaching. While this was regretable, the fact that the two age groups involved in the study were both represented on the analyzable tapes was some compensation.

It was decided that for the purpose of this study, analysis of lessons one, five and ten of both male instructors would provide sufficient information for relevant comparisons within Phase Two and between the two phases. There were almost 90 minutes of tape available from these six lessons of Phase Two and they yielded 2208 bits of behavior when analyzed. This analysis was carried out immediately following completion of the designated tapes from Phase One. Identical procedures, described in the next section, were used in all tape analyses.

Recording, Analysis and Display of OSIA Data

Once adequate intra and inter-observer reliabilities were attained the two observers began the cooperative analysis of the designated tapes from both phases of the present study. The task was completed within a span of five days.

The two observers seated themselves in front of a 23-inch Electrohome model ETV-6 television monitor linked to a Sony AV3600, half-inch videotape deck and recorded behaviors from the environments by entering the appropriate category numbers on a ruled "OSIA Tally Form" (Appendix L). These tallies were later transferred to copies of IBM Fortran coding form, 2262-1, from which IBM data cards were punched. Data were not directly entered onto the IBM form 5050 because the spaces for digits were so small that attention to accuracy would have fully occupied the recorder. The observers alternated as recorders, changing after each lesson was completed. The observer not recording called out the category number of the displayed behavior. If there was disagreement the tape was backed up and reviewed, more than once if necessary, to arrive at agreement. This procedure satisfied both observers that the highest degree of reliability possible in categorizing behaviors was maintained throughout the analysis.

The data were transcribed to IBM punch cards, and analyzed by the 360/30 computer facilities of the University of Alberta. The program was developed by Flatham of the Division of Educational Research, Faculty of Education. This program was capable of handling an interaction analysis system of up to 20 categories and of displaying results in an appropriate matrix of up to 20 rows and 20 columns.

The program was capable of generating print-outs including the following information relevant to the present study:

1) Matrices including cell totals as percentages of column, row and the total matrix.
2) Row and column totals as well as column percentages of the total matrix.
3) Ratios of indirect/direct teacher talk; student/teacher talk; and silence/talk; or any other ratio between cell or category totals that were of interest to the investigator.
4) Combined matrices in any combination desired.
5) Comparison of steady state, diagonal, cell frequencies and percentages of total matrix.

Interpretation of Matrices

Interpretation of matrices in this study was limited essentially to inferences related to the presence or absence of the critical characteristics in the videotaped learning environments. References to and comparisons with previous research utilizing either FIAS or OSIA are questionable because of several unique features of the present environments. Not only does this study deal with physical activity as contrasted with conventional classroom activity but in the unusual setting of the swimming pool. In addition, perusal of the tapes indicated that instruction and therefore interaction are highly individualized. Submersion in water limits both vision and hearing of pupils so that much interaction is considerably more private than would be the case in a classroom or even in a gymnasium.

These conditions had other effects. For example, in a regular classroom attention can be shifted easily and often indirectly: "May we go on now class?" In the present environments it may be necessary to request attention, direct teacher behavior, as many as three times before all pupils are aware that anything has been said to get their attention. Measures of indirectness/directness, such as the I/D and i/d ratios, as well as student/teacher talk and silence/talk ratios would all be affected.

Perhaps the most important reason for care in making comparisons is the prominence of the emotional dimension in beginning swimming classes. Most children are at least wary and many are highly anxious especially during early classes. One boy in Phase One was so anxious that his classroom teacher reported that he began to show clear signs of emotional tension as early as one hour before dismissal on afternoons that swimming instruction was to be held. For the preliminary screening session and on the days of the first two lessons he was in tears before the dismissal buzzer went and he arrived on the pool deck in the same state. While his reaction was not typical, it is clear from viewing the tapes that a number of children in both 1A and 1B experienced real problems of the same type. It seems apparent that this situation calls for teacher behaviors of a sort quite different from dealing with the same children in conventional classroom activities.

Some general statements of comparisons of aspects of the present matrices with previous work by Flanders and/or his co-workers will be made but these references will be to highlight contrasts or to facilitate explanations.

CHAPTER 6

RESULTS AND DISCUSSION

OVERVIEW

In Phase One of the present study, the investigator developed an underlying theory or rationale, applicable to teaching swimming to children and then translated that rationale into curricular materials consistent with it. Sixteen critical characteristics linking rationale and curriculum were identified and the investigator instructed two groups of non-swimmer children in an attempt to create learning environments which displayed these characteristics. Videotape recordings of complete lessons or substantial portions of lessons were made and then analyzed to generate data with which to respond to the research questions.

Phase Two began by recruiting and training two male and two female instructor candidates in the present approach to teaching non-swimmers. All four were freshmen entering the Faculty of Physical Education at this university. Following a twenty-hour training period, each of the four instructed a group of non-swimmer children. Data corresponding to that collected in Phase One were collected for Phase Two as a basis for assessing the efficacy of the instructor training procedures and to compare results from the two phases.

Results from the two phases are reported and discussed separately under two major headings: 1) Achievement of pupils, 2) Representation of the critical characteristics in the learning environments. This second heading will include relevant discussion of evidence, or lack of it, from the Hough (1967) interaction analysis data as well as observational evidence from the videotapes.

PHASE ONE: ACHIEVEMENT OF PUPILS

Achievement, Seven and Eight Year-olds, Class 1A

Table 2 summarizes information on five variables collected with respect to each child in Class 1A and results of the tests carried out following the series of ten forty-minute lessons.

The five girls and seven boys in this group averaged 7.84 years of age, 50.6 inches in height, and had an average reported I.Q. of 107.1. Socio-economic status (SES) of the father or guardian averaged 44.58 on Blishen's (1967) scale. All of these children had been unable to swim any

TABLE 2

Phase One: Seven and Eight Year-olds, Class 1A

Summary of Information and Final Test Results

1	2	3	4	5	6	Non-Stop Distance in Final Test (Feet)			10
						7	8	9	
Subject	Sex	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 7, 8, 9
A 1	F	7.3	136	39.66	51.0	21	56	72	149
A 2	F	7.3	101	39.76	48.5	9	0	8	17
A 3	F	8.4	126	27.77	49.5	0	0	0	0
A 4	F	8.6	94	37.14	51.0	14	8	8	30
A 5	F	8.5	117	68.80	50.0	15	20	21	56
A 6	M	8.3	102	29.43	54.0	10	31	30	71
A 7	M	7.9	76	28.96	48.5	7	0	6	13
A 8	M	7.1	101	32.14	46.5	0	0	0	0
A 9	M	8.1	99	74.27	54.0	11	0	10	21
A10	M	8.2	120	76.01	54.0	10	25	20	55
A11	M	7.3	101	53.25	50.0	0	0	0	0
A12	M	7.1	112	27.77	50.0	0	0	0	0
Class Average		7.84	107.1	44.58	50.6	8.1	11.7	14.6	34.4
Female Average		8.02	114.8	42.63	50.0	11.8	16.8	21.8	50.4
Male Average		7.7	101.6	45.98	51.0	5.4	8.0	9.4	22.8

measurable distance when screened prior to the lessons. During the final test period following completion of the lessons the group averaged 8.1 feet and 11.7 feet in the non-stop distance swim test in the face down and back body positions respectively. In the combination swim in which the child started in his or her preferred body position and at a time of their own choosing attempted to change to the other body position, the average was 14.6 feet. While there was no fixed time interval between the three test items, it was never less than three minutes. The investigator observed the children for signs of fatigue and further, encouraged them to rest until they felt ready to swim again. After each initial trial of an item the child was asked, "Are you satisfied that that is as far as you can swim or would you like to try it once more?" In cases where two trials were made, the better one was recorded. This practice was followed for all children in both phases.

During the test period, four of the twelve children, three boys and one girl, were unable to swim any measurable distance in any of the three conditions. The girl had missed lessons four through seven with a sinous infection but the three boys had attended all ten sessions. Two of these boys were the youngest in the group, 7.1 years, and the third was one of three children 7.3 years of age.

Four of the children, two boys and two girls, swam twenty feet or more in the back and combination conditions.

The greatest distances in all three conditions were recorded by one of the two youngest girls in the class who swam 21, 56, and 72 feet in the front, back, and combination conditions respectively. Her reported I.Q. was 136.

As a sub-group, the girls' averages in the three conditions were more than double the boys'.

Discussion

Age did not have a consistent effect on achievement since the highest achiever was one of the two youngest girls, both of whom were 6.5 months below the class average. However, it may be more than coincidence that all three of the boys who remained non-swimmers were considerably younger than the average. Two of them were nine months and the third was six months younger than the average. In the case of one of the two youngest non-swimmer boys, A8, it is likely that being nine months younger and 4.1 inches shorter than the average was important. When he stood flat-footed in the shallowest part of the instructional area, the water line was at his mouth. During the preliminary interview he indicated that he had never been in the water at a lake or pool but reported seeing dead fish at the edge of a lake which he believed had been killed by poison crabs. The second of the two youngest non-swimmers, A12, had previously waded in a lake and reported once being in a row boat with his father. He had never been to a pool nor had he ever seen either parent in a bathing suit but he expressed no particular anxieties about water.

The third non-swimmer boy, All, was articulate in detailing an assortment of dangers to be found at a nearby indoor pool. These included life guards who could not see because they did not wear glasses, a broken bottle on the floor of the pool that somehow could not be removed, and what he described as a "whole bunch of diseases". His fears were further compounded by visions of people coughing, spitting, and urinating in the water. Relevant excerpts from these and other preliminary interviews are found to be in Appendix M.

The difference in average I.Q. of 114.8 to 101.6 in favor of the girls may have contributed to their higher achievement.

While four children were unable to swim any distance in any condition, an additional three, while able to swim face down, could not cover any distance on their backs. But of the five in the class who did learn to swim on their backs, four swam substantially farther in that position than face down.

An obvious source of difficulty for all but the most confident was an average height of 50.6 inches in water that ranged in depth from 40 to 43 inches over the instructional area.

The preliminary interviews indicated that none of the four who remained non-swimmers had been in a pool prior to the lessons and only one had ever been in lake water. Of the eight who learned to swim, five had never been to a pool but six reported enjoyable visits to lakes even if only on a single occasion during a family vacation.

Perhaps the most significant achievement of the group was the fact that all of them, including the four who remained non-swimmers, showed regular and continual, if gradual, improvement in both their physical and emotional competencies in relation to water.

Achievement, Nine and Ten Year-olds, Class 1B

Table 3 summarizes variables measured and test results following the ten forty-minute lessons. The six girls and six boys in Class 1B averaged 9.78 years of age, 54.3 inches in height and had an average reported I.Q. of 108.1. SES of the father or guardian averaged 32.97 on Blishen's (1967) scale. Non-stop distances in the final test period for the front, back, and combination swim conditions averaged 14.3, 59.4, and 31.4 feet respectively.

All twelve children swam some distance between eight and twenty feet face down, but two of the boys were unable to swim any distance on their backs. The best two performances were by girls, both of whom were older than the class average, while the youngest in the class, a boy 9.1 years old, recorded the third best total distance.

TABLE 3

Phase One: Nine and Ten Year-olds, Class 1B

Summary of Information and Final Test Results

1	2	3	4	5	6	Non-Stop Distance in Final Test (Feet) 7	8	9	10
Subject	Sex	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 7, 8, 9
B 1	F	10.1	121	39.76	53.5	17	310	150	477
B 2	F	10.1	113	30.03	54.0	19	11	15	45
B 3	F	9.2	127	29.31	52.5	14	52	25	91
B 4	F	9.6	86	28.61	55.0	13	11	7	31
B 5	F	9.3	92	31.30	55.0	11	7	8	26
B 6	F	10.6	105	29.71	56.5	15	150	75	265
B 7	M	9.9	106	28.22	53.5	8	7	8	23
B 8	M	9.3	99	28.12	51.0	13	7	10	30
B 9	M	10.6	97	37.14	57.5	18	8	10	36
B10	M	9.1	129	37.90	57.0	20	150	47	217
B11	M	10.3	96	45.48	53.5	14	0	12	26
B12	M	9.3	126	30.08	52.0	10	0	10	20
Class Average		9.78	108.1	32.97	54.3	14.3	59.4	31.4	107.3
Female Average		9.82	107.3	31.45	54.4	14.8	90.2	46.7	155.8
Male Average		9.75	108.8	34.49	54.1	13.8	43.0	16.2	58.7

As a sub-group, the girls' averages were all higher than the boys'. There was a difference of only one foot in the average face down swim but, in the back condition the girls more than doubled the boys' average and tripled them in the combination swim.

Discussion

The girls and boys, as sub-groups, were quite homogeneous with respect to age, I.Q., SES, and height. The markedly superior relative performance of girl B1 in the back and combination swim conditions, was the most important factor in the substantial differences in average distances in these two test conditions in favor of the girls.

Six of the ten children successful in swimming on their backs recorded shorter distances than when swimming face down. This observation underlines the difficulty in mastering a back float. However, once a comfortable back float has been achieved and after some initial practice in propulsion in that position, the learners appeared to pass a critical point and were soon able to swim substantially farther in that position than in the more easily learned front position. Instability in the back float position coupled with greater difficulty in regaining a standing position likely combined to heighten anxiety and complicate learning. But once learned the advantage of having the nose, mouth and eyes clear of the water at least some of the time appeared to facilitate breathing and spatial orientation and contributed to quite dramatic increases in non-stop distances covered. This would appear to account for class averages of 14.8 feet face down and 90.2 feet on the back despite the fact that all twelve children contributed to the first average while only ten contributed to the second.

Comparison of Achievement, Classes 1A and 1B

Table 4 compares selected measures and average distances swum in the three conditions of the final test by Classes 1A and 1B. The difference in the average ages of the two classes of 1.74 years (20.88 months) is accompanied by a difference of 3.7 inches in average height in favor of 1B. However, the older children of 1B came from homes of lower SES, 32.97 compared to 44.58 for 1A. It may be that the lower SES of the families of the older children operated as a selective factor in keeping these children away from pools and beaches and out of relatively costly instructional classes. Reported I.Q.'s for the classes as a whole were nearly identical but as sub-groups, the girls of 1A were noticeably higher and the 1A boys noticeably lower at 114.8 and 101.6 respectively than their older counterparts.

Class 1B averaged greater distances in all three conditions of the final test with the greatest difference in the back condition, 11.7 feet for 1A and 59.4 feet for 1B.

Pleasant experiences related to natural waters

TABLE 4

Phase One: Comparisons of Averages for Selected Measures And Average Distances Swum in Final Test, Classes 1A and 1B

	1	2	3	4	5	6	7	8
					Average Non-Stop Distance in Feet			
Class or Sub-group	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 5, 6, 7
Class 1A	7.85	107.1	44.58	50.6	8.1	11.7	14.6	34.3
Class 1B	9.78	108.1	32.97	54.3	14.3	59.4	31.4	58.7
Girls 1A	8.02	114.8	42.63	50.0	11.8	16.8	21.8	50.4
Girls 1B	9.82	107.3	31.45	54.4	14.8	90.2	46.7	155.8
Boys 1A	7.71	101.6	45.98	51.0	5.4	8.0	9.4	22.8
Boys 1B	9.75	108.8	34.49	54.1	13.8	43.0	16.2	58.7

reported in the preliminary interviews by ten of the twelve children in 1B appeared to interact with their greater height and generally higher levels of physical, intellectual, and emotional maturity, accruing from almost two more years of life, to contribute to higher levels of achievement. These positive factors apparently offset the fact that only two children in 1B had been to a swimming pool prior to instruction in these classes. This lack of experience as a group was consistent with interview reports from 1A which indicated that nine of these children had never visited a pool. This situation existed despite the fact that all twenty four children lived within walking distance of publically owned indoor and outdoor swimming pools.

REPRESENTATION OF THE CRITICAL CHARACTERISTICS IN THE LEARNING ENVIRONMENTS OF PHASE ONE

The following section will deal with evidence of the representation of the critical characteristics in the videotape of learning environments of Phase One. Evidence from both interaction analysis data and from the observational (descriptive) analysis of the videotapes will be discussed.

Characteristics examinable through the OSIA tally sheets or matrices have been identified as: 1.1, 1.2, 1.3, 1.4; 2.5; 4.1 and 4.3.

Critical Characteristic I.1

Teacher behavior is flexible but an indirect warm style predominates.

Flanders (1965) defines teacher flexibility as

> ... a measure of the change a teacher makes in his verbal influence from one activity period to another. We measure this by noting the ratio of indirect influence (I) to direct influence (D) in one activity period and comparing it with the corresponding ratio in other activity periods (p. 15).

Five different activity categories were identified in academic classrooms: introducing new materials; evaluation; discussion; supervising pupil activities; and routine administration (*loc. cit.*). A perusal of the tapes indicates that these categories of activity, not surprisingly, have little or no relevance to the present environments. None of Flanders' five activity categories is maintained over any significant period. New material is presented in very short episodes of 10-30 seconds. The most persistent situation is a highly individualized atmosphere in which the children work on generally assigned tasks. The teacher makes brief statements and directs attention of the class to important ideas or techniques but much of the interaction is spontaneously related to pupil activity.

It is clear that Flanders' conception of flexibility relates to shifts in the degree to which the teacher is indirect or direct. One of his major theoretical positions (1965; 1967; 1969; 1970) has been that indirect teacher behavior should be associated with ambiguous learning goals and as goals become clearer more direct teacher behavior will facilitate learning. This type of differential behavior is one of the goals of flexible teaching.

Table 5 indicates the shift in ID ratios as the lessons of Phase One progressed. In both classes 1A and 1B there was a decided shift towards greater directness as learning goals were clarified in agreement with Flanders' position. For the class of younger children in 1A the ratio in lesson one is 1.23, indicating 23 per cent more indirect than direct teacher statements, and it drops to 0.77, indicating 23 per cent fewer indirect than direct statements in lesson ten. The less pronounced change towards more directness in class 1B in which the ID ratio dropped from 1.01 to 0.83, may be related to the greater maturity and confidence of this group. It is possible that there was less confusion and ambiguity related to goals among them in the beginning and they may well have proceeded to clarifying their goals more quickly.

Hunt and Joyce (1967) take the position that the ability to behave in a structured way is generally accessible to teachers but a reflective style that " ... utilizes the learners' frame of reference to encourage questioning, [and] hypothesizing ..." (p. 254), is infrequent. They see this style as the key to developing flexibility, which is to say a variety of teaching patterns for use under appropriate

TABLE 5

ID Ratios for Analyzed Lesson Environments From Phase One

Class	Lesson				
	1	2	4	7	10
1A	1.23	1.06	0.87	0.96	0.77
1B	1.01	0.98	0.64	0.86	0.83

circumstances. This is in close agreement with Flanders' (1965) contention that,

> The direct teachers lack those social skills of communication that are involved in accepting, clarifying, and making use of the ideas and feelings of students. The indirect teachers have these skills, even though they are not in use most of the time (p. 116).

Table 6 is a combined matrix of all lessons analyzed in Phase One. Examination of row 11 reveals how the investigator reacted to pupil-initiated responses and provides a basis for determining the circumstances of teacher indirectness. Cell frequencies in row 11, Table 6, show that of the 715 pupil-initiated responses, 298 or 41.6 per cent were followed by teacher acceptance, category 3. A further 101 were followed by directed practice, category 13, while in 99 cases the teacher reacted with praise or reward. On no occasions was a pupil-initiated remark followed by criticism. In summary, the total number of indirect teacher responses to pupil-initiated responses was 445 compared to only 142 instances of direct teacher response. These frequencies would be consistent with the display of a reflective or indirect teaching style.

Teacher reaction to directed practice, category 13, in Table 6 should also be examined. Row 13 includes 2037 tallies of which almost half, 937, appear in the 13 x 13 steady state cell which indicates extended practice by students. The next most frequent subsequent behaviors are

TABLE 6

Phase One: Combined OSIA Matrix, Classes 1A and 1B

Lessons 1, 2, 5, 7 and 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	2	6		2		3	5	10			6	3	6				43
2	14	227	30	35	1	56	140	273			141	77	314		12	1	1321
3	3	73	7	17		31	26	99			64	13	106		5		444
4		17	4	5		12	1	30		94	38	7	31		4		243
5		23	2	1	0	10	4	28		31	13	46					158
6	1	55	6	24		178	20	111		6	55	10	86	1	47	2	602
7	2	144	5	3	1	14	90	49			27	20	92		5		452
8	5	246	13	39	1	134	61	376	1	8	126	43	239		99	7	1398
9								1	0								1
10	1	4	40	18	2	12	1	18		0	4		12		1		113
11	7	99	298	40	1	60	13	69			18	5	101		3	1	715
12		26	7	5	148	6	5	19			7	1	52			1	277
13	8	383	26	39	4	50	81	247		1	175	80	937			6	2037
14			1											1			2
15		18	5	14		36	4	61		4	20	4	10		26		202
16				1			1	7			3	1	5			0	18
T	43	1321	444	243	158	602	452	1398	1	113	715	277	2037	2	202	18	8026
%	.5	16.5	5.5	3.0	2.0	7.5	5.6	17.4	0	1.4	8.9	3.5	25.4	0	2.5	.2	100

I/D = 0.901   S/T = 0.237   Si/Ta = 0.3917

in order: praise and reward, 383 times; requests or commands, 247; student-initiated responses, 175; and corrective feedback, 81 times. These observations provide further support for the fact that the environments were characterized by flexible teacher behavior.

Of 8026 bits of behavior categorized in the matrix in Table 6, 22.5 per cent fall into categories 1 to 3, which relate to acceptance and reward and thus to teacher warmth. Integrative or indirect teacher behavior implies the presence of warmth which Flanders (1965, p. 4) considers essential if the student is to be free to act with the spontaneity and initiative required for effective problem solving.

Table 6, the combined matrix for Phase One indicates that 8.9 per cent of all behaviors were student-initiated statements. This is indicative of a secure environment where children were confident that their reactions would find acceptance and even reward. Flanders describes a pupil-initiation ratio (PIR) as a measure of the proportion of student talk judged to be an act of initiation. The PIR is calculated by dividing the sum of student-initiated responses by the sum of all student talk and multiplying by 100. He reports that "One can expect that an average PIR of many different kinds of classes would be fairly close to 34" (Flanders, 1970, p. 103). In the present environments this ratio is 90, which indicates a situation highly compatible with student-initiated responses.

The above discussion supports the contention that the learning environments of Phase One were characterized by flexible teacher behavior within which an indirect, warm style predominated.

Critical Characteristic 1.2

The learning environment is structured and maintained so that optimal (facilitative) levels of arousal predominate.

No attempts were made to measure arousal levels *per se*. Facilitative levels of arousal would be indicated by a willingness of students to persist in dealing with both teacher and self-assigned tasks. Absence of this persistent activity would be revealed by tallies in category 16, non-functional behavior, which in fact appeared only 18 times, 0.2 per cent. Ten of these tallies in category 16 are accounted for by the convention of starting and ending each session with this category number.

Examination of responses to category 8, teacher requests and commands, is of interest here also. Cell frequencies in row 8 provide the information. Of the 1398 requests and commands, the 8 x 8 steady state cell frequency indicates that 376 were longer than 3 seconds. The most frequent response to follow a request or command was category 2, praise and reward, which occurred 246 times. The typical situation here was for the teacher to make a request and then immediately reward any valid attempts to comply. In instances where students could not or would not attempt a task, the reward might come in the form of predicting future success which is defined by Hough as category 2 behavior: "I'll bet you can do it", or by rewarding the display of simpler, more tolerable versions of the task. In these ways external stressors were minimized and pupil responses encouraged. This is reflected in the 239 (8 x 13 cell) instances, in which requests were followed by directed practice and by the 126 (8 x 11 cell) instances where students responded with a relatively broad, unexpected type of self-initiated statement.

These inferences are supported by the fact that during the first lesson several of the most anxious children in both 1A and 1B spent considerable time holding the gutter, back turned to the teacher, facing the end wall. Several frequently left the pool to sit on a nearby bench to observe, presumably to allow anxiety to subside. By the end of the second lesson this behavior had all but disappeared and all but the smallest boy in 1A moved freely about the instructional area.

The above discussion supports the contention that in the learning environments of Phase One facilitative levels of arousal predominated.

Critical Characteristic 1.3

The tempo of activity is generally continuous and moderate but may be interrupted briefly by decisions of either teacher or learners.

Again, breaks in functional activity would be indicated by category 16 tallies. Of the 18 in Table 6, 10 are accounted for by the convention of starting and ending each session with this category number. The remaining 8 instances of irrelevant behavior represent about 21 seconds of the total 5 hours of analyzed videotape.

Teacher interruptions were brief. The tally sheets reveal only 1 instance where as many as 8 consecutive tallies of teacher talk in the same category were recorded. This was in category 6, information and opinion. There were 2 instances of 5 consecutive tallies of category 8, requests or commands. These instances represent time intervals of 12 to 24 seconds.

Several instances of longer uninterrupted teacher talk in which several different categories of behavior appeared in the tally sheets. Lesson 10 of 1B contains the longest, a 29 tally mix of categories 2, 3, 6, 7 and 8. This represents just over a minute of continuous talk. Episodes involving demonstrations, category 15, frequently appeared with up to 10 or 15 consecutive teacher talk tallies.

The 13 x 13 cell in Table 6 shows a frequency of

937 which is 46 per cent of the total directed practice. The tally sheets reveal that a series of 10 to 20 consecutive category 13 tallies were common in all lessons videotaped. Most students frequently worked steadily for many minutes at a time since so much of the verbal interaction was with individuals. It was common to note eleven children busy practicing or helping each other while the teacher and one child talked and worked together.

Examination of column 11, Table 6, reveals which behaviors preceded pupil-initiated responses. This bore on whether or not students felt free to interrupt class activity. Of the total 715 category 11 responses, 175 followed directed practice, 141 followed praise or reward, and 126 either followed or were interjected into requests or commands being made by the teacher. This kind of interaction suggests an atmosphere free of domination in terms of authority. The students frequently initiated responses after directed practice, responded to reward and felt confident enough to interject their own ideas into teacher statements.

The PIR referred to under discussion of characteristic 1.1 indicating that 90 per cent of all student talk was initiated rather than elicited is worthy of re-mention.

Such category 6 statements by the teacher as, "When you are ready ...", and "Rest when you want to ..." frequently appeared and the videotapes revealed that students took this prerogative.

The above discussion supports the contention that the activity in Phase One environments was continuous and moderate and interruptions resulted from decisions by either teacher or students.

Critical Characteristic 1.4

Willingness to attempt or risk tasks either teacher or self-assigned, is met with appropriate positive verbal or nonverbal reaction, and/or corrective feedback.

Teacher assigned tasks were identified by a request or command, category 8. What followed category 8 remarks by the teacher is seen in row 8 of Table 6. This has already been discussed under characteristic 1.1. In addition to those requests that took longer than 3 seconds, the most frequent responses were reward or further information from the teacher, categories 2 and 6, or directed practice, student-initiated responses or demonstrations, categories 13, 11 and 15. All of these categories with the possible exception of 6, are essentially positive reactions to requests or commands.

Students were free to re-structure tasks or to set alternate tasks for themselves. This is reflected in the high percentages of reward and acceptance that follow both teacher requests and student practice. It is also reflected in the shift in frequency of corrective feedback as lessons progressed. Table 7 compares percentages of behavior in categories 2 and 7 of all lessons analyzed in Phase One.

While percentages of praise or reward remained fairly constant there were substantial increases in the percentages of feedback. This indicates a consistent shift from reward for effort or willingness to attempt tasks, matters of process, to focussing students' attention on correct or desirable form or technique, matters of content.

Considerable nonverbal teacher behavior was evident in all environments. Rewarding gestures as nods, smiles, laughter and hand clapping, as well as reassuring contact such as pats on the back or head were common. Observation of the tapes indicated that the contingencies of such nonverbal teacher behavior were parallel to use of acceptance and reward categories 1, 2 and 3.

Beginning with the fourth lesson the teacher began by directing activity from the deck and did not enter the water until it was clear that some combination of nonverbal behavior, most often proximity and small but apparently critical amounts of physical contact or support, were required by one or more members of the class. A student might refuse to attempt a free float until the teacher gave momentary contact to get him into the horizontal position. Once this had been done the student often repeated it with no further assistance, or with only an

TABLE 7

Phase One: Percentages of Category 2 and Category 7 Behavior in Analyzed Lessons

	Class	Lesson				
		1	2	4	7	10
Category 2	1A	20.8	20.1	17.9	15.0	17.0
Praise and Reward	1B	16.1	15.4	12.4	14.0	15.3
Category 7	1A	0.7	4.9	7.1	4.4	9.0
Corrective Feedback	1B	2.4	2.8	6.2	6.8	11.3

appropriate symbolic cue, verbal and/or nonverbal.

The above discussion supports the contention that in Phase One environments willingness to risk tasks was met with appropriate positive verbal or nonverbal reaction and/or corrective feedback.

Critical Characteristic 2.1

Tasks center around principles that influence human movement in water in both vertical and horizontal planes.

The important principles involved in movement in the water are summarized in Figure 1 (p. 32) of this study. Tasks designed to provide concrete, enactive experience with these principles were developed and are described in detail on pages 223-240 of "Teaching Beginning Swimming", Appendix A. These tasks were incorporated into the lessons of Phase One. The videotapes contain frequent examples of the verbal and motor responses of the students to these tasks.

The three fundamental principles, around which the tasks were structured are: buoyancy and other factors in vertical motion; body shape and position; and propulsion including positive and negative influences. References to episodes in the tapes will be made to illustrate how these principles were presented and to give an indication of reactions of students.[1]

Buoyancy. (1B1.1.740) Teacher: "Get right down with your chin on the water. Stand on one big toe. (Excited laughter and chatter) Can you do that when you're on the deck?" Students: "No!" (Chorus) Teacher: "How come you can do it here?" Student: "'Cause the water's around us and it's holding us up." Teacher: "Can you feel the water holding you up?" Students: "Yes!" (Chorus)

(1B1.1.998) Teacher: "See if you can touch the floor of the pool with your hand." Student: "I can't get down." Teacher: "Why not?" Student: "I keep floating up!" Teacher: "Was it hard to get down?" Students: "Yes!" (Chorus) Teacher: "Why was it?" Student: "The water pushes you up!" Teacher: "What did you think before you started swimming?" Student: "I thought I'd sink." Student: "I thought it would pull me down."

(1B1.3.104) The class was trying to get into a back float with a flutter board. Student: "My surfboard keeps coming up! I can't make it go under!" Teacher: "Kids, try this for a minute. Ron can't put his surfboard under. It's very hard. Try it. (Children try submerging the board) Did you feel how hard it is to put it under?" Students: "Yes!" (Chorus) Teacher: "Listen to this for a minute please. Which way were you pushing the board?" Students: "Down!" (Chorus) Teacher: "And which way was the board trying to go?" Students: "Up!" (Chorus) Teacher: "How come the board's going up?" Student: "Because the water is pushing it up." Teacher: "That's exactly what the water does when you go in it, doesn't it?" Student: "Yes, you want to go down but you can't!"

---

[1] References to taped episodes will be made with the following code: Phase and Class 1A (or 1B). Lesson 3. Tape reel number 4. Tape counter indicator 437. This reference would appear as 1A3.4.437.

Body shape. Throughout the lessons, reminders were given of the importance of establishing good body shape before attempting to swim. (1B1.1.735) Teacher: "Get right down there with your chin on the water, put your face in and stretch out long and straight, like a rocket."

(1A1.1.314) Teacher: "One of the things we want to try to do is to stretch out long and still." Student: "I can do that." Student: "Should I try it?"

(1B1.1.880) Teacher: "Stretch out nice and straight and use your hands to push water back."

Propulsion. (1A1.1.519) Teacher: "If I were paddling in my canoe and I did this, (Teacher uses small paddle while standing in the water) which way would I go?" Students: "That way." (Some point with their hands) Teacher: "When you push water back, what does that make the canoe do?" Student: "Go to the front." Teacher:

"Stretch out in the water nice and straight and use your hands to push water back. That'll make you go to the front. Try it!"

(1B1.1.942) Teacher: "I want you to watch something else before you start back [across the pool]. If you push water back that makes you go forward doesn't it?" Students: "Yes!" (Chorus) Teacher: "What happens if you push water forward?" (Demonstrates with hands) Student: "You go back." Teacher: "Watch. (Teacher demonstrates while floating and moves backward) Did it really happen?" Students: "Yes." (Chorus) Teacher: "Pull water back but then _sneak_ your hands forward so you don't push water the wrong way."

The above discussion supports the contention that tasks set by the teacher in Phase One learning environments centered around principles that control movement in the vertical and horizontal planes.

Critical Characteristic 2.2

Practice activities are predominantly in the water (not on deck) and involve chunks of movement that the learner identifies as qualitative wholes.

Throughout the videotaped segments of the learning environments of Phase One the classes worked continuously in the water. The only times that students left the water were to practice water entries or in several cases, in lesson one, to reduce anxiety. There were also a few incidental cases of students getting out of the water to jump in when the rest of the class was occupied with swimming and some instances of children leaving to go to the washroom.

The indirect accepting behavior of the teacher, especially in the early lessons, allowed students to identify their own "qualitative wholes". (1A1.1.545) During practice of propulsion after it was first introduced, a boy, A6[1], immediately began to swim an alternate, overarm stroke, his version of the front crawl. The demonstration had been of a simultaneous underwater arm action.

(1A1.1.608) During the first lesson A7 had been leaving the water to jump in as the rest of the class worked on swimming. Late in the lesson the teacher invited children to use the time as they pleased including " ... trying to jump in like ... [A7] ... did." A timid boy, A11, crouched on the edge of the pool as if to jump but thought better of it. He sat down, placed both hands on the deck and gently lowered himself into the water. He repeated this several times as other children jumped in. In fact, the others in the class exhibited a wide range of entries all the way up to the same confident leap that A7 had demonstrated informally as the others worked on swimming. These versions of entries were the personal qualitative wholes of the respective children. Their performances made sense to them as responses to the task set by the teacher. This situation was typical of the videotaped environments.

---

[1] See Table 2 (p. 110)

The above discussion supports the contention that the learning environments of Phase One were characterized by water practice of individually identified qualitative wholes that learners considered to be appropriate approaches to the tasks set by the teacher.

Critical Characteristic 2.3

Skilled functional movements emerge by a shaping, social-learning process of gradual metamorphosis or successive modification rather than as a result of the addition of intact parts.

The tapes contain no examples of a class practicing intact segments of strokes under the direction of the teacher. Individual differences were such, despite the common factors in each class, that from the beginning there was no time that the group would have been capable of approaching a prescribed performance ensemble. However, individuals at times rehearsed an isolated segment of their stroke, most often arm actions, while standing or walking. Many of these instances appeared to be overt evidence of covert rehearsal or mental practice.

The tapes abound in examples of shaping or successive approximation of competence in a wide range of responses. Examples of two important categories will be discussed as representative of this characteristic: 1) Desensitization of fear or growth of confidence since this is a prerequisite to skilled activity, and 2) The shaping up of responses from a preliminary rough performance to a more skilled one.

Viewing the tapes indicated that behavior in both of the above categories was often but not always related and that available models added a clear social dimension to the process.

Growth of confidence. In terms of overt behavior the individual with the greatest anxiety about the water was boy B12. Throughout lesson one his behavior continuously became more confident. Reference was made to this boy and several other anxious children in the discussion of characteristic 1.1.

The following highlights his progress in lesson one. (1Bl.1.668) B12 entered the water physically tense, walking stiff-legged with tears on his cheeks. He took a position facing the end wall holding the gutter tightly with both hands and remained there while classmates played noisily. (1Bl.1.692) He accompanied the teacher for a walk in the instructional area. The teacher began this activity facing the boy, holding both of his hands. After a while they walked side by side holding one hand. The teacher left him alone to return to the end of the pool from 8 feet out. (1B1.1.170) B12 walked among his classmates 12 feet from the end wall. (1B1.1.734) He attempted to wash his face and got some water on his chin and lower cheeks. (1B1.1.783) He tried to submerge his face twice in succession. (1B1.1.929) He announced excitedly that he was putting his feet flat on the floor rather than walking on tiptoes. Continual, but slow progress followed.

Mid-way through lesson three (1B3.4.900) B12 was able to report, "I like putting my face in the water." A few moments later, when informed by the teacher that he had just held his face in the water for six seconds, he replied, "Six seconds ... not bad!"

By lesson four he was walking face submerged while holding a flutter board. Those in the class who could swim had just worked their way across the pool face down. The teacher (1B4.5.515) told them to, "Rest, and then come back [swimming] on your back." B12 replied excitedly, "Come back on your back! I can't wait to get over there!" It was not until lesson seven (1B7.9.750) that he did his first free float and not until lesson nine (1B9.13.245) that he added stroking actions. In lesson eight he willingly entered deep water and floated (1B8.11.480) face down holding a pole. In the final test he was able to swim 10 feet face down but had not yet mastered the unassisted back float.

The investigator edited out a 30-minute videotape following this boy's progress in developing confidence and his start towards skilled functional movement.

There was a distinct social learning component observable throughout the lessons. Peers often served as models for each other or assisted each other directly. And further, had there been unpleasant outcomes to classmates or insistent demands placed on reluctant learners it is highly unlikely that B12, or other anxious children, would have been willing to begin attempting responses. Teacher indirectness and acceptance would appear to have had a disinhibiting effect as described by Bandura (1971, p. 11).

Shaping of functional movements. There are large numbers of episodes in the videotapes in which children began with a preliminary, incomplete, inaccurate response and through successive modification developed a movement pattern that was clearly more skilled.

(1A5.7.540) A girl who had been among the most nervous, A2, moved through three successively more difficult tasks to her first prolonged free float and initial attempts at stroking. A male classmate, A9, duplicated each of these successive steps immediately after she had accomplished them to perform his first free float. As these children worked they appeared to share the experience in a mutually helpful way. This social dimension to their activity seemed to bear on their parallel successes.

(1A7.9.235) A6 performed three successive dives, each one more skilled than the last. The third dive was a clean, stretched entry. Verbal cues from the teacher related to modification of the previous performance rather than being concerned with rehearsal of isolated intact parts of the dive. For example, after one attempt, the following instruction was given, "This time try to drop your head a bit more and stretch out straight as you can, as you enter the water."

(1B1.1.880) The practice of using the learner's latest response as the point of departure in improving skill is illustrated also in the following, "Kids, I want you to watch ... [A3] ... swimming. But ... [A3] ... I want you to make one change. This time take it nice and easy." This change was incorporated and resulted in a beginner crawl of noticeably improved quality of movement.

The above episodes are typical of the activity of the Phase One environments and support the contention that a shaping, social-learning process was the prevailing mode in working towards improved skill.

Critical Characteristic 2.4

Learners are free to make significant choices within the general framework established by the teacher.

Students were observed making a wide variety of choices in relation to their activities. This range appeared wider in early lessons when their uncertainty was higher and the teacher was more indirect.

(1A1.1.345) From the beginning of lesson one, A7 appeared completely indifferent to tasks set by the teacher. He left the water to make jump entries five separate times over a 20-minute period beginning at 345. The teacher reacted with acceptance or praise on all but one occasion when no reaction was given. The reward was offered to maintain constructive activity even though self-assigned and not of present concern to the class, as contrasted with this boy's earlier indifference and unwillingness to attempt teacher-assigned tasks. Between jumps he began to attend to tasks the class was working on and by the end of the lesson he worked consistently on these tasks. This constructive behavior persisted from there on.

(1A1.1.340) A9 left the water to clear his eyes and nose after attempting submersion. The teacher reacted with a rewarding statement. In a few moments he returned when requested to do so. Several times later in the lesson he left the water apparently to reduce his anxiety. Each time he returned as requested after a reasonable period out of the water.

(1A1.1.390) Desires of students were not always given approval. After watching A7 jump in, a child asked if he could try it too. The reply, "Not now, we'll be jumping in later", was accepted without complaint. Later (1A1.1.608) when the class was free to try jump entries, a wide variation of styles was observed as children approached this in a natural way without intervention by the teacher. Some jumped as boldly as A7. Others jumped with restraint at first but soon became confident. A timid boy, All, was observed in four successive entries. The first was a slow deliberate entry with both hands in contact with the deck throughout. His fourth was a crouch entry that involved minimal contact of the deck with his hands. He controlled his performance through his own decisions.

Children felt free to make decisions to reject suggestions from the teacher. (1A1.1.414) After pulling a boy into a floating position by holding his hands, the teacher asked, "Would you try that with a board?" The boy shook his head and the teacher patted him on the head as he moved away. In another episode (1B1.1.908) the teacher asked a boy if he was putting his face in the water yet. When the boy said he wasn't, the teacher said, "Let me hold your hands and you stretch out and put your face in the water." When the boy replied that he would not, the teacher again moved away with no sign of disapproval.

These incidents are representative of the Phase One learning environments and support the contention that the learners were free to make significant choices within the general framework established by the teacher.

Critical Characteristic 2.5

Demonstrations and other instructional cues are seldom longer than 30 seconds and focus on one or two specific aspects.

Discussion related to critical characteristic 1.3 has already established that teacher interruptions for all purposes were generally in the 12-24 second range although demonstrations involving 10-15 consecutive teacher talk tallies, which would be 30-45 seconds long, were noted in several lessons.

Given such brief demonstrations it was necessary to keep information restricted to one or two specific points. For example (1A1.1.292) Teacher: "Kids, watch this. Crouch right down and see if you can tip over." (Teacher demonstrates) Students: "Hey look at me!" "Like this?"

(1A1.1.535) After a girl had been practicing swimming for several minutes the teacher stopped the class. Teacher: "Now ... [A5] ... see if you can show us how to get stretched out nice and straight, and then start to use your hands." (A5 demonstrates, children go back to work)

(1B1.1.923) Teacher: "Watch this. Keep your face down when you're swimming, and if you want to do an easy little kick you can do that." (Teacher demonstrates, children set out on width swim)

(1A9.12.143) Teacher: "Kids listen. [A6] ...

show us your crawl. Just go that way. Now watch this swimming. Most of you can do it. See how ... [A6] ... is not working too hard? [A2] ... when you swim, don't work quite so hard. Swim that way and don't work too hard at it."

(1B9.13.190) Many of the class were swimming well on their backs. To introduce the back crawl the following explanation and demonstration was given. Teacher: "Hold. Now look. Try this one on your back. First of all practice floating nice and flat on your back, and then try to swim this way. Hold. Watch it. Look, nice and flat on your back, (Teacher demonstrates) and then right over the water (Right arm) and right over the water." (Left arm)

(1B9.13.375) Teacher: "Hold a minute. Come here for a sec. All right I want you to watch ... [B8] ... Watch what he does to get his hands down on the floor of the pool. Look. His head goes way down and watch his feet come up! (B8 demonstrates) Then up come his feet, see. So see if you can get your head down and your feet up."

No count was made of the distribution of demonstrations between students and teacher but the balance appeared about equal.

The above descriptions are typical of the way in which demonstrations and other instructional cues were presented in the videotaped learning environments of Phase One. They support the contention that these were short and focussed on one or two specific aspects.

Critical Characteristic 3.1

Introductory experiences are selected from an empirically established hierarchy of tasks of increasing difficulty or threat to learners.

Lessons in Phase One were developed using the "Lesson Planning Guide" (Appendix J). The sequence of eleven items outlined on this guide were extensions of the steps detailed in "Teaching Beginning Swimming" (Appendix A). This sequence of eleven items constituted a hierarchy of tasks of increasing difficulty. The degree of freedom given the students as a consequence of the indirect behaviors displayed by the teacher, allowed students to re-order the hierarchies individually, at least to some degree. While no two children followed an identical progression of tasks, three hierarchies were identified that closely paralleled the experience of the children in both classes. These hierarchies appear as Appendix O. The greatest variation came in the time it took children to progress through them. Some children made rapid, uninterrupted progress while others travelled over the same route but at a much slower rate.

Observational analysis of the tapes led to an interesting rule of thumb. Submersion of the face and removal of support to float freely were the most frequent blocks to progress. It appeared that about 3 seconds in either of these conditions was a critical interval. Momentary submersion or floating did not guarantee progression to the next step. But once practice had resulted in the extension of the momentary response to about 3 seconds the student appeared ready to move on to the next task in the hierarchy. There was also a situation-specific dimension. A 3-second submersion with support did not mean that the individual could repeat this when floating freely. As additional threat was added to submersion and floating tasks in the early stages the individual had to begin again with momentary submersion and progress to beyond the 3-second barrier.

Use of the "Lesson Planning Guide" (Appendix J) which was based directly on "Teaching Beginning Swimming", (Appendix A), combined with an accepting, indirect approach resulted in introductory experiences in the videotaped learning environments which were selected from an empirically established hierarchy of tasks of increasing difficulty or threat.

Critical Characteristic 3.2

Initial propulsive attempts are made while horizontal in the water and involve use of hands and arms in the preferred style of the individual.

All videotaped activity in Phase One was in the water as contrasted to portions of the time being devoted to deck practice or drills. Throughout the videotaped learning environments there was an emphasis on achieving a stretched horizontal position before beginning attempts at propulsion. Use of the curricular materials ensured that this aspect of this characteristic would be present.

The preferred arm action of the individuals was displayed during initial propulsive attempts because no demonstration was presented for use as a model. It is apparent that previous experience of all children would include observations of people swimming and recall of these observations could serve individuals with symbolic modeling performances. However, in both classes 1A and 1B the introduction to propulsion followed a demonstration and discussion related to the action of a small aluminum paddle. Following this demonstration in class 1A (1A1.1.519) the children who could float at that point in the lesson, stretched out and attempted to swim. Four children used a simultaneous breast stroke style arm action, and two an alternate crawl style arm action. The other six children were not yet floating and they either observed classmates or continued working at their own level. In class 1B (1B1.1.869) during their first attempts at propulsion, four children began with simultaneous arm action and three used an alternate arm action. Five children were not ready to attempt swimming at that point.

The above discussion supports the contention that the Phase One videotaped environments were characterized by initial propulsive attempts while learners were horizontal in the water and that preferred arm styles were employed by learners.

Critical Characteristic 3.3

Secondary propulsive experience is focussed on extending personal distance swimming ability and adding a variety of patterns.

Throughout the lessons of Phase One the children were encouraged to extend their personal distance achievement.

(1A1.1.949) Teacher: "How many stops did it take you to come over [across the pool]?" Students: (Shout numbers from one to five) Teacher: "OK. It doesn't matter how many, just see if you can go back with fewer stops." (1A1.1.980) Student: "Mr. Smith, I only took one stop all the way across!"

Often both extending distance and attempting to vary the pattern were emphasized at once. (1A3.2.868) Teacher: "Now those of you who can swim stretch out in the water and do some swimming, I want you to go, listen, go all the way across. Stop when you need a rest but don't walk, and then start again. Count the number of stops. Remember how many times you had to stop last time?"

Students: "Yes!" (Chorus) Teacher: "Well, think about it. Go across and sometimes you can swim face down if you want and sometimes on your back."

(1B4.6.649) Teacher: "Now listen! I want you to work your way across, sometimes face down and sometimes on your back. Don't walk."

Throughout Phase One there was no differential valuation placed on simultaneous as opposed to alternate arm actions face down. Underwater recoveries of arms in either body position were advocated only when overwater recoveries of arms apparently restricted distance swimming ability. In the back position a simultaneous arm action was advocated. This was because when an alternate arm action is used, the lateral distance from the long axis of the body to the propelling hand produces a slewing motion which is eliminated in simultaneous stroking.

The above discussion supports the contention that Phase One learning environments were characterized by attention to extending personal distance swimming ability and adding a variety of swimming patterns.

Critical Characteristic 3.4

As distance and versatility improves emphasis is on applying simple formulations of buoyancy, body shape, and propulsion to develop efficiency rather than on duplicating (imitating) standard swimming strokes or parts of them.

The decision was made that efforts to develop the standard swimming strokes should be delayed until learners had the ability to swim about 25 feet by their preferred versions of fundamental swimming. During the final test, four children from each class were able to swim 20 feet or more non-stop. For this reason there was not much attention to standard strokes during Phase One. The following excerpts indicate the approach taken when standard strokes were worked on.

The flutter kick is used with both the standard front and back crawl. Several students in 1B used a front crawl-type arm action in lesson one and attention was drawn to the standard flutter kick leg action in the following way. (1B1.1.923) Teacher: "Watch this. Keep your face down when you're swimming and if you want to do an easy little kick you can do that." (Demonstrates)

The front crawl arm action and breathing technique were emphasized in lesson nine in both 1A and 1B. (1A9.12.180) Teacher: "When you're swimming this kind of swimming, (Demonstrates while standing) that's called the crawl. Try to do this. Try to breathe by blowing out some air in the water and then turn your head up to the side and go (Turns head and inhales sharply) and try to take some air in that way. Then keep swimming along. Don't lift your head, just turn it to the side instead. Try some of that stroke."

(1B9.13.067) Teacher: "Listen. Please look. Quite a few of you swim stretched out straight with your arms coming over the water, don't you? Over the top. I want you to do a little practicing of that, and listen, when you want some air see if you can just blow out in the water a bit and turn your head to the side. Don't lift it just turn it to the side and get some air. Now practice that for a while."

The back crawl technique was approached in similar fashion. (1B9.13.250) Teacher: "Now look. First of all get a nice flat float. Easy kick. And then watch the arms again. Right up towards the ceiling. Straight up! (Continues talking while demonstrating on back) Nice and easy but get your head back nice and flat."

The above discussion indicates that little attention was paid to development of the standard strokes. But when these strokes were attended to they were approached through an attempt to apply principles to improve efficiency rather than through duplication of standard strokes or parts of them.

Critical Characteristic 4.1

Reinforcement in the form of positive evaluation or response correcting feedback is offered frequently and specifically in terms of distance, quality, frequency, duration (time), and in various combinations of these factors.

The prevalence of praise and reward, as well as corrective feedback, categories 2 and 7, has already been discussed under characteristics 1.1 and 1.4 earlier in this chapter.

Two examples of the use of distance and frequency as a means of providing reinforcement and feedback were presented in the discussion of characteristic 3.3 above. These occurred at (1A1.1.949) and (1A3.2.868). The emphasis in these incidents was on "how far" and "how many stops". In the same discussion there was an incident that suggested the reinforcement value of evidence of increased distance ability (1A1.1.980) when a girl reported excitedly that she had stopped only once in crossing the pool. Her tone of voice and facial expressions made it quite clear that this was reinforcing evidence of progress. Similar situations occurred frequently and involved many of the children.

Increased swimming time was implied in improved distance ability but time was not explicitly used in this way. The only direct use of time came in respect to duration of submersion of the face. The best example (1B3.4-.932) involved three boys who wanted to be timed on this task and recorded 4.5, 6, and 8 seconds respectively. Each of these performances was followed by praise, i.e. reinforcement, from the teacher and the second boy reacted, as reported earlier, with "Six seconds! Not bad!"

Quality of movement was stressed continuously. (1B1.1.899) Teacher: "I want you to watch ... [B3] ... But I want to ask you to make one change. Don't swim so fast. Nice and slow and easy."

(1B6.7.168) Teacher: "[B10] ... take it easy now. That's better (swimming) but take it nice and slow."

Reinforcement was frequently mixed with corrective feedback as the following examples indicate. (1B4.6.328) A girl, A3, had reported difficulty remaining afloat during swimming on her back. Observation indicated she was losing buoyancy through lifting her head. This was pointed out and she was successful with her head back, ears underwater. Teacher: "See ... [B3] ..., as long as you keep your head back you stay on the surface don't you?" Student: (Nods and smiles) Teacher: "Good work."

(1B6.7.090) Teacher to B11: "Boy! You're getting to be a good swimmer. But you are going (stroking) so fast! Take it easy and you'll go farther."

Several episodes previously cited in relation to other characteristics also relate directly to evidence of representation of characteristic 4.1. Quality of performance was stressed at: 1A9.12.143; 1B9.13.190; and 1B9.13.067. Combinations of several aspects in feedback and reward are illustrated in these previously cited excerpts: 1A1.1.535; 1B4.6.949; and 1B9.13.250.

The above discussion combined with the increasing frequency of feedback, category 7, and consistently high frequency of praise and reward, category 2, indicated in Table 7, provide both specific and general evidence of the representation of characteristic 4.2 in the videotaped environments of Phase One.

Critical Characteristic 4.2

Evaluative feedback is in relation to the learner's own past or present achievement levels.

The highly individualized nature of the present learning environments would have made it extremely difficult to relate performances of learners to any standards other than those of the learner's past. Many examples cited previously, particularly those in the discussion of characteristic 3.3, bear out that past performance of learners provided the most frequent standards of comparison. Additional relevant excerpts follow.

Toward the end of lesson one, Class 1B, several children were already swimming a few feet but B12, who had displayed the most anxious behavior of all students, was just beginning to be able to walk around freely in the instructional area. The investigator encountered B12 walking about 20 feet from the end of the pool. Teacher: "Atta boy ... [B12] ...! Look where you're walking now!"

(1B6.7.106) Teacher: "[B5] ... try to make a new record on your back on the way back across the pool."

(1B3.4.817) Teacher: "That's the best swimming you've ever done, isn't it ... [B2]? That's terrific. Put your face down first, then away you go."

(1B3.4.900) B12 floats on his back while holding the teacher's forearm tightly across his chest with both of his own arms. Teacher: "Let go with one arm. (B12 complies) How about that! Alright!" B12 immediately does his first free float holding a board. Teacher: "Now look at that! You could go across the ocean like that. Isn't that neat?" B12: "That was cool!" As this episode took place many of his classmates were already floating on their backs and some were swimming but no comparisons were made.

By lesson four, most of the children in the older class could float face down or swim. B11 was still unable to submerge his face. Teacher: "[B11] ... let's see you stretch out with your face down in the water." B11: "I can't do that." Teacher: "Well wash your face first. (He does) A little bit more, just a bit more. Now just duck under very quickly. (He does this also) Good! You did it see. Good!"

Whenever performance goals were referred to when addressing the entire class it was always made clear that personal past performances were to be used as targets for improvement. (1B1.1.914) Teacher: "Kids, come on over to this side and let's see what you can do about getting across the pool. We'll just walk or swim, whatever you can do." Again, (1B6.8.070) Teacher: "Hold. Now if you can swim, I want you to go to the side and start across the pool. Do you remember the least number of stops you've taken to go across?" Students: (Shout numbers from zero to seven) Teacher: "See if you can do better than that this time."

The above examples support the contention that in the videotaped environments of Phase One, evaluative feedback was provided in relation to the learner's own past or present achievement levels.

Critical Characteristic 4.3

As learning progresses, the teacher stretches the reinforcement schedule and becomes more discriminating in dispensing reinforcers.

Table 7 indicates that there was a slight tendency towards fewer category 2, praise and reward statements, as lessons progressed. While the frequency of praise and reward declined only slightly, the tapes reveal that higher standards of attending behavior by students, and more precise focus on teaching points were required even when the opening minutes of lesson one are compared with the closing minutes of that lesson. The shift to more discriminating standards in judging effort and performance is reflected in the substantial increases in category 7 statements, corrective feedback, which increased quite steadily from lesson one (0.7% in 1A, 2.4% in 1B) to lesson ten (9.0% in 1A, and 11.3% in 1B).

The marked shift toward a more direct teaching style, indicated in Table 5, is related to more discriminating standards set by the teacher. As lessons progressed teacher behavior became more direct and more corrective feedback was provided.

This situation may be specified in several ways. Discussion of characteristic 2.4 included reference to a boy, A7, who began lesson one by showing complete indifference to teacher-assigned tasks. His first activity (1A1.1.345), repeated jump entries, was rewarded by the teacher despite the fact that class tasks involved experience with buoyancy and body shape and had nothing to do with water entries. However, after several such entries he began to attempt tasks the class were working on and again received reward and praise but this time it was for more appropriate behavior. Later in lesson one (1A1.1.480) an attempt at inappropriate behavior, leaving the pool, was stopped at the request of the teacher and his compliance was rewarded immediately. This episode gives some insight as to how reinforcement contingencies provided by the teacher changed but without substantial reductions in the frequency of use of praise and reward. It also suggests how the initial accepting, indirect style of the teacher shifted to a more direct style through the introduction of corrective feedback. This shift also applied to behavior related to confidence. In lesson three the teacher gently washed the faces of two anxious boys, A8 (1A3.2.1004) and A9 (1A3.2.814), and they accepted this with no sign of discomfort or annoyance. Up to that point their unwillingness to attempt this on their own had been accepted.

Higher standards of attending behavior and adherence to task directions were required as soon as the children began to feel confident in the environment. For example, in lesson three (1B3.4.695), Teacher: "Hold! Remember what we said. One board or one ball. Either one." And later (1B3.4.831) Teacher: "Kids! Hold please! (Hand gestures) Please, no talking. Kids. Hold please. Pay attention here now. No talking. Please pay attention here ... [B6] ... [B9] ... I want you to pay attention here. [B12] ...? Good! Look, get right down with your chin near the water and then tip forward gently and stretch right out."

Upward shifts in personal performance standards were promoted by withholding reinforcement until improvement appeared. (1B4.6.504) Student B7: "I'm too cold." Teacher: "You'll be alright. If you'd been working a little more you'd feel a lot better. You've been standing around too much." (1B5.6.803) Student B5: "I went over in nine stops." Teacher: "Oh, you can do better than that if you take it easy." (1B5.6.829) Teacher: "No ... [B5]

..., you don't need the board. Either do you ... [B7] ..., put them up. You don't need the board ... [B7]. Atta boy! You're all set to swim."

Fading of instructional cues was approached in several ways. The instructor began lessons from the fourth on by working from the deck and did not enter the water until it was apparent that one or more children needed his proximity and/or physical support to maintain efforts. During lesson eight, in the deep water of the West Pool, the instructor was in the water for the first fifteen minutes and then worked from the deck for both safety reasons and to promote independent behavior of the children. Once children felt secure in the environment, a frequent strategy was to offer minimal assistance so that new achievements might be experienced. (1B3.4.1008) A girl, B6, was floating on her back while holding a flutter board. Student: "How do you stand up?" Teacher: "Lift your head." The girl tried but was unable to do this. Teacher: "Alright, put your feet down, see if you can get your feet down to the bottom." Again, she was unable to do this. The teacher then offered minimal support as she regained her footing. She continued practicing and within a few minutes was able to regain her footing unassisted.

Student B12 experienced the greatest problems in mastering his fear of the water. He did not take his first swimming strokes until about midway through lesson nine, (1B9.13.245) As soon as this happened he worked continuously on his own, remote from the teacher. Intermittently he asked for help from peers or the teacher but most of his activity was independent from that point on.

The above discussion supports the contention that as learning progressed, the teacher stretched the reinforcement schedule and became more discriminating in dispensing reinforcers. This tended to be accompanied by a fading of instructional cues as the children became more independent.

PHASE TWO

The purpose of the second phase of the present study was to determine whether the understandings and behaviors required of the teacher for effective use of the curriculum could be acquired readily by freshmen entering the Faculty of Physical Education at the University of Alberta. These individuals were considered to be reasonably typical of the large group of persons who annually train to instruct swimming in Canada.

The efficacy of the 20-hour training program described in Chapter 5 will be examined through comparing data collected from the non-swimmer children who made up the classes in both phases. It is not intended that the learning environments of Phase Two will be examined in detail as was done for Phase One. It is intended that Phase Two data and environments will be examined and compared with those of Phase One to a degree sufficient to evaluate the effectiveness of the instructor training procedures.

PHASE TWO: ACHIEVEMENT OF PUPILS

Achievement, Seven and Eight Year-olds, Classes 2A and 2B

Tables 8 and 9 summarize data for the two classes of seven and eight year-old children in Phase Two. Class 2A was taught by a male, 2B by a female. One child dropped out of each class after lessons began. This left seven children in each class. Both classes were quite comparable in age and reported I.Q., but 2A came from families with noticeably higher SES, 53.88, compared to 40.26 for 2B. An average height of 53.0 inches provided a definite advantage for 2B over 2A who were considerably shorter averaging 50.7 inches. The height advantage may have interacted with the presence of a female instructor in 2B to contribute to the higher averages in the front and back swims. While children in both classes appeared to relate well to their instructor it is possible that the female had an advantage in gaining the confidence and communicating with the seven and eight

TABLE 8

Phase Two: Seven and Eight Year-olds, Class 2A

Summary of Information and Final Test Results

1	2	3	4	5	6	Non-Stop Distance in Final Test (Feet)			10
						7	8	9	
Subject	Sex	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 7, 8, 9
2A1	F	8.5	118	68.80	51.5	9	13	10	32
2A2	F	8.6	125	62.04	51.0	10	6	8	24
2A3	F	7.2	101	34.85	51.0	23	10	21	54
2A4	F	Withdrew - sinous infection							
2A5	M	7.6	84	45.48	50.0	8	0	8	16
2A6	M	8.6	100	37.75	51.0	13	32	27	70
2A7	M	7.8	104	52.68	50.5	12	19	15	56
2A8	M	7.4	128	75.57	50.0	5	2	5	12
Class Average		7.95	108.6	53.88	50.7	11.1	11.7	13.4	37.7
Female Average		8.10	114.7	55.23	51.2	14.0	9.7	9.7	36.7
Male Average		7.85	104.0	52.87	50.4	9.0	13.3	13.8	38.5

TABLE 9

Phase Two: Seven and Eight Year-olds, Class 2B

Summary of Information and Final Test Results

						Non-Stop Distance in Final Test (Feet)			
1	2	3	4	5	6	7	8	9	10
Subject	Sex	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 7, 8, 9
2B1	F	6.8	104	38.21	52.5	28	150	28	206
2B2	F	7.7	116	43.69	51.5	23	15	20	58
2B3	F	7.7	123	60.42	53.0	22	14	18	54
2B4	F	7.8	85	49.55	53.5	23	21	10	53
2B5	M	8.2	105	29.31	54.0	14	10	10	34
2B6	M	8.2	103	29.31	54.0	15	7	10	32
2B7	M	8.4	111	31.30	52.5	18	12	10	40
2B8	M	Parents withdrew for vacation							
Class Average		7.82	106.7	40.26	53.0	20.4	32.7	15.1	68.1
Female Average		7.50	107.0	47.97	52.63	24.0	50.0	19.0	92.8
Male Average		8.27	106.3	29.98	53.50	15.7	9.7	10.0	35.3

2B5 and 2B6 are identical twins

year-old children. Difficulty in changing body position front to back, or vice versa, resulted in shorter average combination swims compared to front and back swims for 2B.

All seven children in each class who continued to the test period were able to swim a measurable distance. Indeed, all but three children in the shorter class, 2A, swam some distance over 10 feet, and 13 of the 14 children tested were able to do so in both back and front body positions.

Comparison of Achievement, Seven and Eight Year-olds, Both Phases

Table 10 compares class averages and selected measures for the three classes of seven and eight year-olds involved in the study.

Average ages and I.Q.'s compare closely. Class 2A had a noticeably higher average SES and class 2B enjoyed a substantial advantage in height over the other two classes.

Examination of the videotapes of classes 2A and 2B indicates that no children displayed extreme anxiety around the water. While several in each class were somewhat hesitant in the beginning all but two adjusted quickly and developed confidence steadily. Two boys in Class 2A, (2A5 and 2A8) were noticeably more timid than others in their age group and remained so but despite this swam 8 and 5 feet re-

TABLE 10

Comparisons of Averages for Selected Measures and Average Distances Swum in Final Test, Classes 1A, 2A, 2B, All Seven and Eight Year-olds

	1	2	3	4	Non-Stop Distance in Final Test (Feet)			8
					5	6	7	
Class	**Age**	**I.Q.**	**SES**	**Height**	**Front**	**Back**	**Combo**	**Sum of 5, 6 & 7**
1A	7.84	107.1	44.58	50.6	8.1	11.7	14.6	34.3
2A	7.94	108.6	53.88	50.7	11.1	11.7	13.4	37.7
2B	7.82	106.7	40.26	53.0	20.4	32.7	15.1	68.1

spectively in the final test. Both of them had been among those children who reported that they were anxious and worried about the water but neither could pinpoint any specific incidents or reasons.

Average distances in the final test compared closely in the combination swim for all three classes. Classes 1A and 2A showed little difference in the front and back swims while Class 2B achieved substantially better averages in the front and back swim than did the other two classes.

Achievement, Nine and Ten Year-olds, Classes 2C and 2D

Tables 11 and 12 summarize data for the two classes of nine and ten year-old children in Phase Two. Class 2C was instructed by a female and 2D by a male. One boy dropped out of 2C when his parents moved out of the country following the fourth lesson. The two classes were comparable as to age and height but Class 2D had a markedly higher average reported I.Q., 114.1 compared to 101.6, and SES, 51.88 compared to 46.01, for 2C.

Contrary to the experience with the younger children, the higher achieving group in this case was instructed by the male. Again, both groups appeared to relate well to the instructors and one has no way of knowing whether the sex of the instructor had any differential effects.

TABLE 11

Phase Two: Nine and Ten Year-olds, Class 2C

Summary of Information and Final Test Results

						Non-Stop Distance in Final Test (Feet)			
1 Subject	2 Sex	3 Age	4 I.Q.	5 SES	6 Height	7 Front	8 Back	9 Combo	10 Sum of 7, 8, 9
2C1	F	9.1	91	29.31	54.0	15	11	9	35
2C2	F	10.1	94	29.31	55.5	19	9	13	41
2C3	F	8.1	119	39.75	55.5	11	32	15	58
2C4	F	9.3	95	52.68	52.0	7	0	6	13
2C5	M	10.5	86	52.68	50.0	33	5	15	53
2C6	M	10.5	118	68.80	54.5	19	9	14	42
2C7	M	9.8	108	49.55	52.5	33	5	11	49
2C8	M	Family moved out of the city							
Class Average		9.63	101.6	46.01	53.4	19.6	10.1	11.9	41.6
Female Average		9.15	99.75	37.76	54.25	13.0	13.0	10.8	36.8
Male Average		10.27	104.0	57.01	52.33	28.3	6.3	13.3	48.0

TABLE 12

Phase Two: Nine and Ten Year-olds, Class 2D

Summary of Information and Final Test Results

1 Subject	2 Sex	3 Age	4 I.Q.	5 SES	6 Height	Non-Stop Distance in Final Test (Feet) 7 Front	 8 Back	 9 Combo	10 Sum of 7, 8, 9
2D1	F	9.7	126	75.16	54.0	24	150	50	224
2D2	F	9.0	110	55.19	52.0	23	16	19	58
2D3	F	10.1	110	60.93	54.5	13	5	11	29
2D4	F	9.6	108	29.71	53.5	19	11	23	53
2D5	M	10.6	114	35.05	56.0	150	280	600	1030
2D6	M	[illegible]	118	55.62	54.0	31	300	150	481
2D7	M	9.3	109	45.52	54.5	42	150	50	242
2D8	M	9.3	120	57.82	52.5	14	10	10	34
Class Average		9.[illegible]	114.1	51.88	53.9	39.5	115.3	114.1	268.9
Female Average		9.60	113.5	55.25	53.5	19.8	45.5	25.8	91.0
Male Average		9.63	115.3	48.50	54.3	59.3	185.0	202.5	446.8

While 2D averaged twice as far in the face down condition as did 2C, greater mastery of the back body position by 2D resulted in an average distance of 115.3 feet compared to 10.1 feet for 2C. The difference in average distance on the combination swim was very similar, 114.1 feet for 2D and 11.9 feet for 2C.

Comparisons of Achievement, Nine and Ten Year-olds, Both Phases

Table 13 compares class averages and selected measures for the three classes of nine and ten year-olds involved in the study.

Average ages and heights are very close while 1B had a distinctly lower SES, 32.97, compared to 2D at 51.88. Class 2D also had the highest average reported I.Q. of the three groups, 114.1 against 108.1 for 1B, and 101.6 for 2C.

Two children in Class 2C (2C4 and 2C8) were noticeably anxious in the beginning and three children in 2D (2D3, 2D4 and 2D8) also showed clear signs of uneasiness. All of these children or their parents had reported a distinct concern and anxiety about water. In no case was a specific incident or any particular cause cited.

All seven children in Class 2C and eight in 2D who continued to the test period were able to swim a measurable distance. All but one were able to cover distances in both front and back body positions. Class 2D achieved ex-

TABLE 13

Comparisons of Averages for Selected Measures and Average Distances Swum in Final Test, Classes 1B, 2C, 2D, All Nine and Ten Year-olds

	1	2	3	4	Non-Stop Distance in Final Test (Feet)			8
					5	6	7	
Class	Age	I.Q.	SES	Height	Front	Back	Combo	Sum of 5, 6 & 7
1B	9.78	108.1	32.97	54.3	14.3	59.4	31.4	106.2
2C	9.63	101.6	46.01	53.4	19.6	10.1	11.9	41.6
2D	9.61	114.1	51.88	53.9	39.5	115.3	114.1	268.9

tremely high totals in their distance swims. One of these children, 2D5, recorded a combination swim of 600 feet, 8 lengths of the East Pool, and a total for the three conditions of the final test of 1030 feet. This boy was the tallest, oldest, and one of the two or three most mature children, in all of the classes. Three other children in 2D recorded impressive distances on the final test. Each one of these had a total of more than 220 feet.

THE VIDEOTAPED ENVIRONMENTS OF PHASE TWO

Interaction Analysis

Because the two female instructors were so soft spoken it was not possible to analyze any of their lessons using Hough's OSIA. All of the videotaped portions of lessons one, five and ten, for Classes 2A and 2D conducted by the male instructors were analyzed using the OSIA instrument. Table 14 is a combined matrix of the OSIA analysis of the videotape from those six lessons. On the average, 15 to 20 minutes of each 40-minute lesson were recorded. All six individual matrices and combined matrices for each of the two classes, 2A and 2D, are to be found in Appendix N.

Table 15 compares category frequencies and category percentages from the combined matrices of Phase One

TABLE 14

Phase Two: Combined OSIA Matrix, Classes 2A and 2D

Lessons 1, 5, and 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0					1											1
2		29	12	6		3	41	24			18		91		1	1	226
3		15	3	4		8	19	16			18	1	49		4		137
4		1	1	0			2	2		16	9	1	11		4		47
5					0	2	2				4		8		1	1	18
6		6	3	1		34	2	13		1	6		34		17		117
7		17	9	2		5	52	7		1	13	7	120		16		249
8		7	7	2	1	17	4	30		2		1	65		31		179
9									0								0
10		4	9	2		2		2		0			4		1		24
11	1	9	68	7		7	13	4			2		14		3		128
12				1	17		4					0	2				24
13		137	25	18		21	103	58			40	14	531		6	4	957
14														0			0
15		1		4		16	7	21		4	6		23		8	2	92
16						1		2					5			1	9
T	1	226	137	47	18	117	249	179	0	24	128	24	957	0	92	9	2208
%	0	10.2	6.2	2.1	.8	5.3	11.3	8.1	0	1.1	5.8	1.1	43.3	0	4.2	.4	100

I/D = 0.787 S/T = 0.181 Si/Ta = 0.920

TABLE 15

Comparison of OSIA Category Frequencies and Percentages

For Combined Matrices, Phase One and Phase Two

Combined Matrix	OSIA Categories																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Total
PHASE ONE																	
Frequency	43	1321	444	243	158	602	452	1398	1	113	715	277	2037	2	202	18	8026
Percent	.5	16.5	5.5	3.0	2.0	7.5	5.6	17.4	0	1.4	8.9	3.5	25.4	0	2.5	.2	100
PHASE TWO																	
Frequency	1	226	137	47	18	117	249	179	0	24	128	24	957	0	92	9	2208
Percent	0	10.2	6.2	2.1	.8	5.3	11.3	8.1	0	1.1	5.8	1.1	43.3	0	4.2	.4	100

(Table 6) and Phase Two (Table 14).

Table 15 indicates that in the combined OSIA matrices from the two phases of the present study, there are seven of the sixteen categories that have percentage frequencies within one percent of the same values. These are categories 1, 3, 4, 9, 10, 14 and 16. Another four categories, 5, 6, 12 and 15 are within three percent of the same values, and in a fifth, category 11, the difference is 3.1 per cent. The extent of this agreement suggests that a number of characteristics in the learning environments of Phase One and Two had a good deal in common. Comparisons must be made cautiously since class sizes varied from seven to twelve, taped segments were not of constant length, and the presence of one or two highly anxious individuals will alter category frequencies substantially.

Category 13, directed practice or activity, accounted for almost half, 43.3%, of Phase Two environments but only 25.3% in Phase One. A significant portion of this difference was accounted for by the greater number of anxious children in Phase One classes. In many instances ten or eleven of the children worked independently while the investigator interacted with one or two of the anxious children. OSIA tallies, in such situations, recorded this interaction and did not allow for representation of the coincident directed practice engaged in by the other ten or eleven children.

The frequencies of category 8, requests and commands, also differed noticeably between the two environments. In Phase One, this category accounted for 17.4% as compared with only 8.1% in Phase Two. Again, in this instance, the more anxious children would appear to give rise to a reasonable portion of the difference. The tapes reveal that many requests and commands in Phase One environments relate to teacher attempts to help students locate tolerable versions of threatening tasks. This is clearly illustrated in the edited tape of the progress of B12, the most anxious of all the children in either phase. For example, approximately ten minutes of the forty minutes in lesson nine was devoted to helping him over the hurdle of the initial free float and first attempts at propulsion. Teacher talk over this interval is predominantly requests, category 8, and reward, category 2.

The above discussion would appear to apply also to the differences in frequencies between category 2, praise and reward, and category 7, corrective feedback, revealed in Table 15. The present rationale indicates the need for praise and reward, category 2, to help anxious learners establish desirable behavior patterns including a willingness to attempt threatening tasks. As confidence is strengthened and skilled performance begins to emerge, the rationale indicates that corrective feedback, category 7, would then be necessary to shape up the emerging behavior.

The trend towards higher frequencies of corrective feedback is clear in matrices from both environments. Table 7 shows this increase for Phase One and Table 16 indicates the phenomenon in Phase Two.

Table 16 also indicates that frequencies of category 2 behavior remained quite steady, with one noticeable exception, as was the case for Phase One. The exception is for Class 2D in which it dropped sharply to 3.2% in lesson ten after having held at about 10% in lessons one and five. This may be associated with the high achievement of this group in at least two ways. First, no particular difficulties were being experienced in lesson ten, as is clearly evident from the videotapes. This is reflected in the fact that category 13, directed practice, accounted for 60.3% of the videotaped segment of lesson ten. This being the case the teacher was stretching the reinforcement schedule and the activity was being maintained increasingly by the natural reinforcement arising from achievement. Second, the children worked steadily, aware of the fact that it was the last lesson, and quite possibly in anticipation of the test period to follow. This possibility would be consistent with the fact that the most frequent teacher talk category in this lesson was corrective feedback, category 7, 18.2%, followed by acceptance, category 3, 6.7%, and praise, 3.2%. These features would tend to be indicative of a positive environment in which the children worked consistently at

TABLE 16

Phase Two: Percentages of Category 2 and Category 7 Behavior in Analyzed Lessons

	Class	Lesson		
		1	5	10
Category 2	2A	13.5	14.1	12.2
Praise and Reward	2D	9.7	10.0	3.2
Category 7	2A	5.0	13.8	15.5
Corrective Feedback	2D	4.6	10.0	18.2

meaningful tasks, while the teacher stood back to observe and offer individuals suggestions when needed.

Returning to a more general consideration of evidence of the similarity of the videotaped environments, it is worth noting that by far the greatest percentage of student talk is in category 11, emitted responses as compared to elicited responses or student questions, categories 9 and 12. This strongly suggests both meaningful activities in the lessons and a warm secure relationship with the instructors. This possibility is strengthened by examining row 11 of Table 14 which indicates what behaviors followed emitted responses from students. Of the 128 instances of emitted responses from pupils, 68 or 53.1% were followed by teacher acceptance, category 3. The next most frequent teacher reaction was feedback, 13 instances or 10.2%; praise, 9 instances or 7.0%; information and teacher questions, both with 7 instances or 5.5% each.

One more indication of the similarity between learning environments of the two phases will be discussed. This concerns the shift in ID ratios that is an aspect of teacher flexibility. Table 5 indicates that in Phase One the ID ratios for Class 1A dropped from 1.23 in lesson one to 0.77 in lesson ten. For Class 1B, the decrease was from 1.01 to 0.83. These decreases were associated with greater task orientation as lessons progressed. Table 17 indicates similar decreases in ID ratios in Phase Two.

TABLE 17

ID Ratios for Analyzed Lesson Environments From Phase Two

Class	Lesson 1	 5	 10
2A	0.99	0.82	0.65
2D	1.06	0.70	0.55

The decreases in ID ratios as lessons progressed indicate a clear trend in both environments consistent with the underlying rationale.

It is important to note that while videotape recording quality prevented analysis of any lessons of the female instructors, that the environments in those classes shared many important characteristics with those of the male instructors. Relationships, teaching methods, and sequences of task presentation were distinctly parallel.

SUMMARY

This chapter has reviewed and discussed pupil achievement in Phase One as indicated by a distance swim in three conditions: face down, on the back, and a combination swim in which the pupil was allowed to change body positions as often as desired.

Videotaped segments of Phase One lessons one, two, four, seven and ten were analyzed in their entirety, using Hough's OSIA. Individual matrices and various combined matrices of the results of the OSIA analyses were prepared and examined for evidence of the representation of seven of the sixteen critical characteristics in the videotaped environments.

Observational analysis of the environments was carried out to assess the representation of the remaining nine critical characteristics. Specific references were made to relevant segments of the videotapes.

Achievement of children in Phase Two classes was reviewed and compared with that of Phase One. Videotapes of Classes 2A and 2D, lessons one, five and ten, were analyzed in their entirety, using Hough's OSIA. Individual matrices and various combined matrices of the OSIA analyses were prepared and examined for evidence of their similarity to corresponding data from Phase One.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

THE RATIONALE AND CURRICULUM

The first concern of the present study was the development of a psychological rationale to serve as a framework for the preparation of a curriculum for teaching children to swim.

The rationale appears as Chapter 2 and the curriculum consists of the materials included in Appendices A, B, C and D. Considerable care was taken to see that rationale and curriculum were consistent with each other and that both accommodated relevant aspects of current learning and instructional theory. The investigator considers both rationale and curriculum as points of departure for an on-going process of evaluation and revision. It is recognized that not only should future theory and conceptualizations be assimilated but the current knowledge which has been accounted for in the initial statements of the rationale and curriculum might well be re-ordered or modified in significant ways as a result of reflection, critical examination, or in the light of experience.

It is intended that the present formulations of rationale and curriculum will undergo assimilation and accommodation in a sense quite parallel to the way Piaget (Ginsburg and Opper, 1969) uses the terms in relation to the intellectual development of the child. Future, or unaccounted for present concepts, may be assimilated, that is to say incorporated, into the existing formulations of rationale and curriculum. But it will likely also be necessary to accommodate, that is to say modify, the existing formulations to produce materials that are more coherent and efficient as learning tools.

EFFICACY OF THE CURRICULUM

No Control Group or External Comparisons

No objective means were available with which to assess comparatively the efficacy of the application of the curriculum in the learning environments of the two phases of this study. The literature contains frequent reports of the investigation of various aspects of learning to swim. However, these studies indicate wide variations in such factors as the definition of a non-swimmer; length, number and distribution of lessons; teaching procedures; use of buoyant aids; performance criteria; and ages of subjects.

Frequently, the subjects were college students of only one sex (Burdeshaw, 1968; Holt *et al.*, 1970; Kaye, 1965; Niemeyer, 1959; Scott, 1954). The definition of a non-swimmer has often related to inability to swim a given distance rather than simple inability to swim any distance. Kaye (1965) included subjects who could swim up to 9 feet, Burdeshaw (1968) up to 15 feet, and Holt *et al.* (1970) considered any person not able to swim 75 feet to be a beginning swimmer.

Howell *et al.* (1962) worked with children five to twelve years of age, who had no previous instruction and could not put their faces in the water. This study involved six lessons of twenty-five minutes.

Lewellan (1951) used subjects seven and a half years of age up to nine and a half, and gave them twenty-one lessons of thirty minutes each. His subjects were children who could not swim any distance.

Similar difficulties exist in attempting to compare results with those of public or private swimming instruction programs. Children in these programs are grouped almost exclusively on the basis of the highest formal award for which they have qualified. Thus classes of Red Cross pre-beginners consist of a mix of children entering classes for their first water experience and instruction, those who have been through the class previously but have been unsuccessful in one or more of the test requirements, and those who may be quite skillful in the water but have never taken formal instruction.

Since there is so much variability in entering behaviors and instructional variables the efficacy of the present approach can only be assessed by internal consideration.

It would have been possible to have set up a control group instructed by some other method or approach to teaching swimming. The question then would have arisen as to which method to use as a control. As indicated in Chapter 1, the usual solution to this problem has been to employ the American Red Cross procedures as a control. It was decided, particularly in view of the fact that the Red Cross method almost invariably comes out second best, that this was not worth repeating. While it is common to refer to such generalized and nebulous entities as _traditional methods of teaching swimming_ (or of teaching anything else for that matter), or to use phrases such as _the way swimming is usually taught_, one would find it impossible to verify the objective existence of any even reasonably specific, widely used, set of methods and procedures. It is well known that any two graduates from teacher or instructor training programs of any kind take wide individual prerogatives once in charge of their own classes. One need only observe four or five members of the same graduating class teaching the same content or activity in highly similar physical environments in schools or elsewhere to verify this. Those involved in the supervision of student teachers are continually reminded of this wide range of differences.

It is also apparent that in order for any control method to have been used as a basis for comparison it would have been necessary to develop a complete rationale and to identify an appropriate set of critical characteristics to either guide the establishment of the control curriculum or, if the curriculum was already in existence, to link the curriculum to an underlying rationale. If this had not been done it would have been impossible to escape the criticism that the control method of teaching had not been as adequately explicated as the experimental method. In addition, the primary purpose of this study was the development of a coherent theory-based approach to swimming instruction. The development of such an approach does not require that any external comparisons be made as part of that development. It is reasonable to expect that comparative studies involving the present approach to swimming instruction will be carried out in the future.

Phase One Environments

Of the twenty-four children in Phase One classes, twenty learned to swim face down some distance between 7 and 21 feet. Of the four children who were not able to swim any measurable distance, one, a girl, had missed four lessons with a sinous infection, two of the boys were considerably younger than their classmates and the fourth, another boy, was both younger and 4 inches shorter than his classmates. The preliminary interview indicated that all three of the boys had very limited previous experience with pools or natural bodies of water and two of them revealed clearly negative reactions towards entering water. Despite this, these four who remained non-swimmers, and the other twenty children all displayed regular and continual improvement in both performance and emotional reactions to attempting to extend their competencies.

For these reasons it appears justifiable to conclude that the curriculum provided an effective basis for creating positive learning environments for the non-swimmer children in the classes of Phase One.

Consistency of Environments and Curriculum

Analysis of the selected videotaped segments of the Phase One environments, both the observational analysis, and the analysis of verbal interaction using Hough's OSIA, indicated that these environments displayed considerable consistency with the sixteen critical characteristics that link the psychological rationale and the curriculum. To that extent, the environments represented the implementation of relevant learning and instructional theory in real learning situations.

EFFICACY OF INSTRUCTOR TRAINING

Comparison of Environments

The first basis for evaluation of the efficacy of the twenty hour training program in influencing the acquisition of important relevant understandings and behaviors in the two male and two female instructors involved in Phase Two rests primarily on the comparisons between the combined OSIA matrices from the two phases of the study. These matrices were presented as Tables 6 and 14. Information arising from these tables was further compared in Tables 15, 16 and 17.

On the basis of the data contained in those tables, and of the discussion of these data in Chapter 6, it may be concluded that the verbal interaction of the videotaped learning environments of the two phases of this study had a great deal in common. Frequencies of the various categories defined in Hough's OSIA instrument were in substantial agreement. Similarly, shifts in frequencies in categories 2, reward, and 7, feedback, as well as a clear trend toward decreasing ID ratios, over lessons in both phases, reflect important parallels in the environments. The unusual predominance of category 11, emitted responses of pupils, over other categories of pupil talk was also shared by both environments. This agreement is taken as evidence of the acquisition and display, by the four trainees, of the important understandings and behaviors associated with the present curriculum.

While the soft voices of the two female instructors made analysis of verbal interaction of their classes impossible, a perusal of their videotapes indicated that environments in all four Phase Two classes were quite comparable. This was further reflected in achievement levels of these classes.

Similarities in environments of the two phases were undoubtedly enhanced through modeling effects produced by the use of Phase One videotapes in the training program of the Phase Two freshmen instructor trainees. Common use of the curriculum materials and the lesson planning guides by both the investigator in Phase One and the trainees in Phase Two also ensured that similarities would be apparent when environments were compared.

Achievement of Phase Two Classes

The second major basis for assessing the efficacy of instructor training in Phase Two rests on the achievement of the children in the final test conditions. Comparisons of achievement of classes in the two phases were presented in Tables 10 and 13 in Chapter 6. As might have been expected, in comparing results from groups as small as those involved, variations were wide. However, it is clear that Phase Two classes in general out-performed their counterparts in Phase One.

The seven and eight year-old classes. Among the three classes of seven and eight year-old children in the two phases, the only substantial differences in average values of the variables measured were in the height of Class 2B and the SES of Class 2A. Just what effects a difference in average height of 2.35 inches had on the achievement of 2B is unknown. Observational analyses made clear that, in water averaging 42 inches in depth, the taller groups enjoyed an advantage especially among children who were not only short in height but anxious about submersion. Even moderate wave action resulted in water levels that consistently kept awash nose, mouth, and often eyes of children shorter than 50 inches. This produced a physical environment threatening to children who were anxious about submersion and one in which desensitization of fear was noticeably difficult.

Any differential effects attributable to an average SES of 53.88 in Class 2A, distinctly higher than the other two classes, are also unknown. Blishen (1967, p. 53) reported the mean SES for the 1961 Alberta labor force at 39.20 with a S.D. of 12.64. That would place the mean value for Class 2A at about the 98th percentile. If this contributed any advantage to these children, such advantage must have been offset by other factors. Such compensatory factors are not apparent since other variables measured: age, I.Q. and height, are in close agreement with the other two classes of seven and eight year-olds.

In summary, the two Phase Two classes of seven and eight year-olds attained higher average distances in the front swim condition when compared with Class 1A of Phase One. In the back swim condition 1A and 2A had identical averages while Class 2B averaged almost three times as far. In the combination condition differences among the groups were small.

On the basis of achievement of the Phase Two children in the final test, compared to that of Phase One, instructor training appears to have been effective.

The nine and ten year-old classes. Class 1B had the lowest SES, 32.97, particularly when compared with 51.88 for 2D. Class 2D also had a substantial advantage in average reported I.Q. Age and height averages for all three classes were in a narrow range. As with the younger classes, both Phase Two classes achieved higher average distances in the front swim condition when compared with Phase One nine and ten year-olds. Class 1B was superior in average distances to Class 2C in the back and combination conditions while Class 2D out-performed the other two by a wide margin in all the conditions.

With respect to Class 2D, it appeared to enjoy a four-fold advantage. The higher average I.Q. and SES, already noted were the first two. The mean value of SES for 2D would fall about the 97th percentile in relation to Alberta's 1961 work force. The third was the fact that the three children who displayed some overt anxiety about the water developed confidence much more quickly than was the case in 1B particularly. The fourth was the presence in the class of three boys and a girl who achieved extremely high totals in the back and combination conditions. Indeed, three of these boys (2D5, 2D6 and 2D7) together swam distances in both the back and combination conditions that were greater than the totals for either of the other classes of nine and ten year-olds. This is particularly impressive when compared with the Phase One class, 1B, which had twelve children in it.

In addition to the possible influence of factors discussed above, the male instructor of Class 2D appeared to display superior teaching skills and behavior. For example, the combined matrix from the videotaped portions of his lessons one, five and ten revealed that 53.3% of the total time was devoted to directed practice, category 13.[1] In the corresponding Phase One class, 1B, only 22.4% of the activity was accounted for in category 13.[2] The combined matrix for instructor 2D also indicated a high percentage of feedback, category 7, 10.8%, compared to 5.8% in 1B, and low percentages of both information, category 6, 3.2%, and requests or commands, category 8, 6.8%. In Phase One classes for nine and ten year-olds, categories 6 and 8 accounted for 8.8% and 17.2% respectively. Thus instructor 2D minimized information and commands while increasing feedback and directed practice. This would appear to be a highly desirable situation. His students were brighter, from homes of higher SES, reasonably free of anxiety, and enthusiastic. For his part, instructor 2D, was responsive to these positive aspects and provided for conditions that contributed to rapid learning.

---

[1] See Table 20, Appendix N.

[2] See Table 16, Appendix N.

In summary, the Phase Two classes of nine and ten year-olds attained higher average distances in the front swim condition as compared to Class 1B in Phase One. Class 2D, as indicated above, was vastly superior to the other two nine and ten year-old classes in all test conditions. In the back and combination conditions 1B attained considerably higher average distances than 2C. On the basis of achievement of the Phase Two children in the final test, compared to that of Phase One, instructor training appears to have been effective.

Class size. Phase Two classes were limited to eight children compared to twelve in Phase One. In fact, since one child dropped out of three of the four Phase Two classes, there were only seven children in attendance for most of the lessons. There were no dropouts in Phase One. This reduction in class size was intended to provide a more tolerable introduction for the instructor trainees. The less complex environments of Phase Two classes appeared to be manageable and no instances of confusion or disorganization on the part of the instructors were apparent in the videotaped segments of lessons. Not only did the instructors appear in control but the children had ample room in which to move and practice and little time was lost due to collisions or waiting for turns.

SUMMARY

The nature of the present study was such that the primary purposes involved the organization of relevant underlying theory or approaches to the representation of behavior, translation of that theory into compatible curricular materials, and the creation of swimming instruction environments consistent with the underlying theory. The design was not intended to allow for drawing conclusions with general application to other swimming instruction environments.

However, it would appear useful to make some statements to summarize conditions identified in the present learning environments.

All twenty-four children involved in the two classes of Phase One continued through to the test period although there were some scattered absences. Of these twenty-four all but four children in Class 1A learned to swim some distance between 7 and 21 feet in the face down condition. All children in Class 1B and all twenty-nine children in the four classes of Phase Two, who continued through to the test period also learned to swim face down. In fact, aside from the four non-swimmers in Class 1A, all but eight children in the six classes were successful in both back and combination swim conditions as well. Since the three children in Phase Two who did not continue to the test period were withdrawn by their parents, one because of an infection, a second for an out-of-town vacation, and the third as a result of the family's moving, the environments may be considered to have been positive with respect to both promoting acquisition of swimming skill and the maintenance of desirable attitudes towards learning despite individual difficulties and widely varying individual achievement.

Flexible teaching behavior, characterized by shifts from direct to indirect verbal participation by instructors, appeared to contribute to the positive reactions of the learners. In all classes analyzed by OSIA the more indirect less demanding, instructor behavior of early lessons was observed to encourage and maintain efforts of learners to overcome their individual difficulties. As learner confidence, both in the physical and social aspects of the environments grew, the increasingly direct influence of the instructor appeared to enhance skill development at least partially because it contributed to the presence of facilitative levels of arousal. This situation was in agreement with

Flanders' (1965, 1969, 1970) findings regarding the differential effects of direct and indirect teaching styles.

Learners were free to control their own pace and rest periods, as well as initiate verbal responses and reorder or modify tasks. This personal responsibility appeared to be important in promoting learning through the maintenance of risk-taking behavior and an optimal level of activity. Both observation of the videotaped environments and examination of the OSIA matrices support the contention that activity levels were consistently maintained in some optimal range. This condition appeared to be enhanced also by application of Skinner's (1968) principle of using artificial reinforcement, in this case acceptance and reward, to maintain and extend emerging complex behaviors. It was also apparent from the videotapes that as learning progressed these artificial reinforcers were replaced by natural reinforcement arising from achievement and a growing sense of competence.

Both verbal and motor responses of learners provided evidence that the concepts of buoyancy, body shape, and various aspects of propulsion were generally well understood and frequently applied to modify activity.

Overt behavior reflecting relevant attitudes such as confidence and willingness to assume risks, as well as the performance of motor responses, were frequently observed to undergo shaping and this process often had clear social influences in which peers served as models or as sources of reinforcement.

Demonstrations and explanations were brief and focussed on one or two specific aspects of class activity. Since demonstrations were frequently by learners and arose directly out of current class activity they appeared relevant and usually met with acceptance and other positive reactions from peers. Instructor demonstrations, in both phases, also arose out of the context of the lesson and appeared to generate positive reactions at least partly because the task modeled was within range of the class or individuals for whose benefit it was presented.

The individual prerogative of pupils to re-order and modify tasks provided an unusual opportunity to observe the relative degree of difficulty of a wide range of tasks. This situation may be contrasted with approaches to teaching swimming in which a fixed order of tasks is presented thus eliminating opportunities for individuals to reveal or develop preferred alternatives. Aside from personal preferences in ordering tasks, there were three tasks that appeared to have special significance. These were: submerging the face; removing support to float freely; and moving about freely in deep water. These specific tasks appeared quite fixed and unavoidable but in the intervals between them there was a good deal of latitude for unique individual progressions. The hierarchies (Appendix O) arrived at empirically from observational analysis of the videotapes appear to represent a sequence of tasks meaningful to learners in the present environments. These tasks could well be described as direct in the sense that they do not depend on transfer of training for their value. Many tasks included in current swimming instruction manuals clearly depend on transfer effects if any value is to be derived from them.[3]

Use of the "Lesson Planning Guide" (Appendix J) appeared to help keep trainee instructors aware of the spread among individual levels of achievement and to attempt to accommodate this information in planning.

Emphasis on the arms and hands as the prime propellers in initial stages appeared successful. This seemed to be at least partially responsible for the smooth, controlled quality of movement observed in classes of both phases. There was little of the frantic, random kind of activity often associated with beginners. Other factors that may have contributed to this unusual quality of movement were concrete personal experience with the feeling of buoyancy, the emphasis on awareness of body shape, and the fact that tasks set appeared manageable to learners at least partly because practice did not require complex imitation.

---

[3] Such tasks as counting fingers while the face is submerged, the "jelly-fish" float, bobbing and breathing while standing, kicking practice while holding a fixed support, must all rely on transfer effects since none is involved in actual swimming.

While type and pacing of reinforcement is a complex subject, the consistently positive environments evident on the videotapes apparently acted to elicit and maintain learner responses. The total absence of criticism and rejection, category 9, appeared to enhance the social environment without any hint of encouraging so-called discipline problems. Corrective feedback, category 7, was second in frequency only to directed practice, category 13, in the combined matrix for Phase Two. This underlines the fact that these children were directed, controlled and corrected in a predominantly positive way. This is not to say that all responses of the children were positively reinforced. Positive reaction was frequently withheld or undesirable behavior of an interpersonal sort was stopped by a respectful request, category 8, rather than through criticism or rejection.

The provision of feedback in a variety of forms related to distance, frequency, duration, quality and combinations of these, appeared both to motivate and direct the efforts of learners. The increasing frequencies of directive feedback, category 7, as lessons progressed in both phases was consistent with expectations based on the underlying theory. In early lessons teacher acceptance and reward both elicited practice activity and maintained it. As the necessary water competencies developed, directive feedback from the teacher helped the learner to shape more skilled and efficient responses. In Phase Two, where learners apparently experienced fewer emotional problems in adjustment to the water, directive feedback was used more frequently, and praise and reward less frequently, than in Phase One classes. This situation was also as would be expected in terms of the relevant aspects of the underlying rationale.

The use of each individual's own past achievement levels as the primary frame of reference in assessing performance appeared to have positive effects on learners. This was evident in the frequency with which children performing at levels well below the best in the class reported personal gains with an obvious sense of pride and accomplishment.

Children in the present study who failed to learn to swim shared several interesting characteristics. They tended to be shorter, younger, to have had fewer positive water experiences especially around natural waters and more often expressed fantasies about aquatic dangers than did more successful peers. A tendency towards neuroticism or less self-sufficient behaviors in non-swimmers who failed to learn to swim has been reported by several investigators (Whiting and Stembridge, 1965; Behrman, 1967; Burdeshaw, 1971). These researchers all emphasize the differences between non-swimmers who are successful and those who remain non-swimmers. Although no formal personality measures were taken in this study, the children who remained non-swimmers were observed to display many behaviors consistent with neuroticism and dependency at least in relation to water activity. Thus, contrary to the popular stereotype, these children had not been frightened by an actual water experience but had literally never been around water to any significant degree. The fantasies of water hazards expressed by several of these children appeared to operate as stimulus controls that were effective in rationalizing their anxiety about water and:

> Once established, defensive behavior is exceedingly difficult to eliminate because it derives self-reinforcing power from its capacity to reduce distress (Bandura, 1971, p. 12).

Commenting on how such defensive behavior may be established entirely through symbolic conditioning aside from personal experience, Bandura continues:

> Conditioning principles would have limited explanatory power if emotional responses could be established only through direct physical experiences. It is not uncommon for people to display strong emotional reactions toward certain things or classes of people on the basis of little or no personal contact with them .... Emotion-arousing words often function as the vehicle for symbolic conditioning. Words that conjure up feelings of revulsion and dread can be effectively used to create new fears and hatreds; conversely, words arousing positive emotions can endow associated events with pleasing qualities (*ibid.*, p. 13).

It is possible that the central problem in dealing with persistent non-swimmers is the elimination of these self-reinforcing defensive behaviors. It is also interesting to speculate on differential implications relative to feelings of anxiety in boys and girls. Given the importance of physical competence and courage in the face of physical danger, in the development of an appropriate sex role identity for boys in our culture, it seems clear that anxiety about immersion in water might have much more complex repercussions for boys than girls. Kagan (1964) comments:

> By the time he is seven he [a boy] is intensely committed to molding his behavior in concordance with cultural standards appropriate to his biological sex and he shows uneasiness, anxiety, and even anger when he is in danger of behaving in ways regarded as characteristic of the opposite sex (p. 162).

It would appear far more acceptable for girls, especially very young ones, to display anxiety about either physical dangers or one's chances of success in mastering technique. Over the many hours of videotape analysis in the present study, the investigator formed the clear impression that elicitation and maintenance of risk-taking behavior of the anxious boys depended, among other things, on an atmosphere completely free of any suggestion that hesitancy or inability to perform a given task was a challenge to their manliness. This was in contrast with the behavior of confident boys who responded enthusiastically to physical challenges.

In relation to instructor training, the curricular materials appeared to provide adequate reference sources. The progression of training procedures (Hunt, 1966) was effective in that all four trainees displayed organized, confident behaviors quite consistent with those implied by the critical characteristics that served as guidelines. While no formal attempt was made to assess the contribution to effectiveness of instructor training of the videotape from Phase One, it would appear from the similarities between OSIA matrices from the two phases, and from observational analysis, that this aspect of training was significant. Complex clusters of behaviors, that would be described as appropriate in relation to the underlying rationale, were frequently displayed by all four trainee instructors. Given the relatively short training period and the scope of topics dealt with, it seems most likely that a key mechanism in the acquisition of such behavioral clusters was a modeling effect. Bandura (1969, p. 148) cites a large group of studies in which this mechanism has been verified. Particularly when desirable behaviors differ in important ways from behaviors that trainees have engaged in or observed in the past, it would be important to provide appropriate modeled performances during training. This was certainly the situation in the present study since specific tasks, pupil-teacher relationships and the high degree of individualized instruction considered desirable in this study are, on the basis of observations by the writer, not usually encountered.

The videotapes of classes in both phases proved a rich source of information about the teaching-learning process in addition to observations already discussed. One of the important insights that arose from the study of the tapes was the fact that the children all covered the same route but at quite different rates and often in different ways. They learned a variety of swimming styles and body positions and water entries. By the end of the lessons some children had mastered to varying degrees all of the tasks in the hierarchies in Appendix O. Others had mastered nearly all of them, still others had mastered relatively few. But if one reviewed the progress of any of these latter individuals as revealed by the videotapes in a time-lapse photography kind of way, one was led to believe that given more time and similar learning environments, all of them would master these tasks. Acceptance of this fact of individual difference would in itself improve most learning environments in which children find themselves.

IMPLICATIONS FOR FURTHER RESEARCH

It is hoped that further attention will be given to the evolution of the present rationale outlined in Chapter

2. What important relevant representations of behavior are missing? How can present or future representations be assimilated, or the rationale accommodated, to account for them? What modifications would improve the curricular materials either in relation to the present rationale or to evolutionary forms of the rationale? Evolution could proceed deductively, by modifying rationale and/or curriculum and then assessing effects within the learning environments. Or it might be done inductively as a result of cues arising in the learning environments and then proceeding to account for these in the curricular materials and underlying theory.

It would be useful to replicate this study using non-swimmers of various ages but applying the present definition of a non-swimmer, using lessons of the same length, frequency, and number, and the same test conditions. Such studies could provide useful information relative to learning rates and achievement standards at various ages as indicated by performance in the three test conditions (non-stop distances in front, back and combination swims).

The influence of the immediate use of buoyant aids for learners who are both anxious and short in height in relation to water depth should be studied. Indeed, the whole question of optimal water depth relative to learner height is of importance.

The experience of several of the anxious learners in Phase One classes opens the question of whether such individuals should be held out of instructional classes, and placed instead in less formal environments, until they are able to maintain themselves in a face down front float of 3 to 6 seconds duration. However, perhaps the heterogeneous grouping in terms of a wide range of emotional responses to immersion in water is desirable even if it results in lower class achievement levels in non-stop test conditions.

Appendix O contains hierarchies of skills, in order of increasing difficulty, in learning to swim and dive. These hierarchies were derived empirically from observing progress of the children in all videotaped segments. The current curricular materials should be examined carefully against these observed progressions and revised where indicated. Effects of such revisions on learner progress would then be of interest.

Additional interaction analysis information could be gleaned by subscripting teacher talk to individuals as contrasted with teacher talk to the class as a whole. Interaction analysis matrices from classes of different sizes and ages would provide insight into effects of these factors on verbal communication. The possibilities of using interaction analysis matrices as a key component in a program evaluating and modifying teacher behavior appear promising. Teachers could compare predicted with actual frequencies in various categories and then seek ways to control frequencies of various categories.

REFERENCES

ABEL, G., KNAPP, B. "The popularity of swimming." Swimming Times, 44, 73-74, 1967.

ALLEN, D.W. (Ed.). Micro-teaching: A description. Stanford: Stanford School of Education, 1967.

AMERICAN NATIONAL RED CROSS. Swimming and diving. Philadelphia: P. Blakiston's Sons, 1938.

AMERICAN RED CROSS. Swimming and water safety. Washington: The American National Red Cross, 1968.

AMERICAN YMCA. New YMCA aquatic handbook. New York: Association Press, 1958.

AMERICAN YMCA. Progressive swimming and springboard diving program. New York: Association Press, 1972.

AMIDON, E., FLANDERS, N.A. The role of the teacher in the classroom. Minneapolis: Association for Productive Teaching, 1967.

AMIDON, E., HOUGH, J.B. (Eds.). Interaction analysis: Theory, research, and application. Reading, Mass.: Addison-Wesley, 1967.

ANDERSON, W.G. "Descriptive-analytic research on teaching." Quest, 15, 1-8, 1971.

ARMBRUSTER, D., ALLEN, R., HARLAN, B. Swimming and diving. St. Louis: C.V. Mosby, 1958.

ATKINSON, J.W. "Motivational determinants of risk-taking behavior." Psychological Review, 64, 359-372, 1957.

AUSUBEL, D.P. "Meaningful reception learning and the acquisition of concepts." In: Analysis of concept learning. Edited by H.J. Klausmaier and C.W. Hains. New York: Academic Press, 157-175, 1966.

BANDURA, A. "Vicarious processes: A case of no-trial learning." In: Advances in experimental and social psychology. Vol. 11. Edited by L. Berkowitz. New York: Academic Press, 1-55, 1965a.

BANDURA, A. "Influence of model's reinforcement contingencies on the acquisition of imitative responses." Journal of Personality and Social Psychology, 1, 589-595, 1965b.

BANDURA, A. "Behavior modification through modeling procedures." In: Research in Behavior Modification. Edited by L. Krasner and L.P. Ullman. Toronto: Holt, Rinehart and Winston, 310-340, 1965c.

BANDURA, A. Principles of behavior modification. New York: Holt, Rinehart and Winston, 1969.

BANDURA, A. Social learning theory. Morristown, N.J.: General Learning Press, 1971.

BANDURA, A., MENLOVE, F.L. "Factors determining vicarious extinction of avoidance behavior through symbolic modeling." Journal of Personality and Social Psychology, 8, 99-108, 1968.

BASOWITZ, H., PERSKY, H., KORCHIN, S.J., GRINKER, R.R. Anxiety and stress an interdisciplinary study of a life situation. New York: McGraw-Hill Book, 1955.

BEHRMAN, R.M. "Personality differences between nonswimmers and swimmers." Research Quarterly, 38, 163-171, 1967.

BERLYNE, D.E. Conflict, arousal, and curiosity. New York: McGraw-Hill, 1960.

BIDDLE, B.J. "Methods and concepts in classroom research." Review of educational research, 37, 337-357, 1967.

BIRDWHISTELL, R.L. Kinesics and context: Essays on body motion communication. Philadelphia: University of Pennsylvania Press, 1970.

BILBROUGH, A., JONES, P. Physical education in the primary school. London: University of London Press, 1963.

BILODEAU, E.A., BILODEAU, J. "Motor skills learning." Annual Review of Psychology, 42, 243-280, 1961.

BILODEAU, E.A. (Ed.). Principles of skill acquisition. New York: Academic Press, 1969.

BIRCH, D., VEROFF, J. Motivation: A study of action. Belmont, California: Brooks/Cole, 1966.

BLISHEN, B.R. "A socio-economic index for occupations in Canada." Canadian review of sociology and anthropology, 4, 41-53, 1967.

BLUMENFELD, W.S., REMMERS, H.H. "Sports preferences of American high school students." Research Quarterly, 36 (2), 205-206, 1965.

BOOKHOUT, E.C. "An observational study of teaching behavior in relation to the social emotional climate of physical education classes." Unpublished Doctoral Dissertation, New York University, 1965.

BRO, V.I. "A comparison of the traditional and the progressive part methods of learning the side stroke." Unpublished Master's Thesis, State University of Iowa, 1954.

BROCKWAY, D.L. "The effectiveness of flotation aids in the teaching of beginning swimming." Unpublished Master's Thesis, State University of Iowa, 1961.

BRUNER, J.S. Toward a theory of instruction. Cambridge, Massachusetts: Belknap Press, 1966.

BRUNER, J.S. The process of education. New York: Vintage Books, 1960.

BUDD, K. "Activity preference survey: Windsor Secondary School, North Vancouver." Unpublished mimeographed report, 1972.

BURDESHAW, D. "Personality profiles of non-swimmers among university women." Journal of Sports Medicine and Physical Fitness, 2, 80-86, 1971.

CANADA SAFETY COUNCIL. "Accident fatalities." Mimeographed annual report of the Canada Safety Council, 1972.

CANADIAN RED CROSS SOCIETY. "1971 annual report of the Water Safety Service." Mimeographed report to the annual meeting of Central Council, Ottawa, 1972.

CANADIAN RED CROSS. Swimming and water safety manual. Toronto: The Canadian Red Cross Society, 1948.

CANADIAN RED CROSS. Water safety instructor's guide and reference. Toronto: The Canadian Red Cross Society, 1963.

CANADIAN RED CROSS SOCIETY, THE ROYAL LIFE SAVING SOCIETY CANADA. "Course conductor notes for instructor training." Unpublished mimeographed notes. Toronto: 1970.

CANADIAN YMCA. YMCA swimming manual. Toronto: National Council of the YMCA, 1933.

CANADIAN YMCA. YMCA swimming manual. (Revised). Toronto: National Council of the YMCA of Canada, 1968.

CARRON, A.V. "Motor performance under stress." Research Quarterly, 39, 463-469, 1968.

CHILD, I.L., WHITING, J.W.M. "Determinants of level of aspiration: evidence from everyday life." Journal of Abnormal and Social Psychology, 44, 303-314, 1949

CHURCH, R.M., CAMP, D.S. "Change in reaction time as a function of knowledge of results." American Journal of Psychology, 78, 102-106, 1965.

CITY OF EDMONTON. "1971 Annual report of the Parks and Recreation Department." Unpublished mimeographed report, 1972.

COUNSILMAN, J. "Theory of the flutter kick." Beach and Pool, 24, 12-13, 1949.

COUNSILMAN, J. The science of swimming. Englewood Cliffs, New Jersey: Prentice-Hall, 1968.

CRATTY, B.J. Movement behavior and motor learning. Second edition. Philadelphia: Lea and Febiger, 1967.

CRATTY, B.J. Teaching motor skills. Englewood Cliffs, New Jersey: Prentice-Hall, 1973.

CURETON, T.K., Jr. How to teach swimming and diving. New York: Association Press, 1934.

DAUGHTREY, GREYSON. "Preferences of 16,000 parents." Unpublished report of the Norfolk Schools, 1959.

DIMITROVSKY, L. "The ability to identify the emotional meaning of vocal expression at successive age levels." In: The communication of emotional meaning. J. Davitz, *et al.* New York: McGraw-Hill Book, 69-86, 1964.

DOUGHERTY, N.J. "A comparison of command, task, and individual program styles of teaching in the development of physical fitness and motor skills." Unpublished Doctoral Dissertation, Temple University, Philadelphia, 1970.

DOUGHERTY, N.J. "A plan for the analysis of teacher-pupil interaction in physical education classes." Quest, 15, 39-49, 1971.

EYSENCK, H.J. "The measurement of motivation." Scientific American, 130-140, May, 1963a.

EYSENCK, H.J. "Anxiety as a mixed concept." British Journal of Educational Psychology, 23, 192, 1963b.

FISHMAN, S.E., **ANDERSON**, W.J. "Developing a system for describing teaching." Quest, 15, 9-16, 1971.

FITTS, P.M., **POSNER**, M.I. Human performance. Belmont, California: Brooks/Cole Publishing, 1967.

FLANDERS, N.A. Teacher influence, pupil attitudes and achievement. Washington: U.S. Dept. of Health, Education, and Welfare, 1965.

FLANDERS, N.A. "The problems of observer training and reliability." In: Interaction analysis: Theory, research, and application. E.J. Amidon and J.B. Hough. Reading, Massachusetts: Addison-Wesley, 158-166, 1967.

FLANDERS, N.A. "Classroom interaction patterns, pupil attitudes, and achievement in the second, fourth, and sixth grades." Cooperative research project No. 5-1055, U.S. Office of Education, 1969.

FLANDERS, N.A. Analyzing teaching behavior. Reading, Massachusetts: Addison-Wesley, 1970.

FLEISHMAN, E.A., **FRUCHTER**, B. "Component and total task relations at different stages of learning a complex tracking task." Perceptual and Motor Skills, 20, 1305-1311, 1965.

FLEISHMAN, E.A., HEMPEL, W.E. "Changes in factor structure of a complex psychomotor test as a function of practice." Psychometrika, 19, 239-252, 1954.

FORD, C. "A comparison of the relative effectiveness between two methods of teaching the whip kick to college women." Unpublished Master's Thesis, University of North Carolina, 1958.

FOX, M. "Activities they wish they'd had in college." Journal of the American Association for Health, Physical Education and Recreation, January, 1957.

GAGE, N.L. "Desirable behavior of teachers." Urban Education, 1 (2), 85-95, 1965.

GAGNE, R.M. The conditions of learning. New York: Holt, Rinehart, and Winston, 1965.

GALLOWAY, J.J. "Nonverbal communication." The instructor, 77, 37-42, April, 1968.

GATES, A.I., *et al.* Educational psychology. New York: MacMillan, 1948.

GILMET, A.G. Personal communication, March 10, 1970.

GINOTT, H.G. Between parent and child. New York: Avon Books, 1965.

GINSBURG, H., OPPER, S. Piaget's theory of intellectual development: An introduction. Englewood Cliffs, New Jersey: Prentice-Hall, 1969.

GODLASKY, C.A. "An experimental study to determine the relative effectiveness of two methods of teaching the crawl stroke in swimming." Unpublished Master's Thesis, Pennsylvania State University, 1955.

HANSS, M.J. "The comparative effectiveness of simultaneous and successive learning of three swimming strokes." Unpublished Master's Thesis, University of Wisconsin, 1937.

HARRIS, M. Basic swimming analyzed. Boston: Allyn and Bacon, 1969.

HEBB, D.O. "Drives and the C.N.S. (Conceptual nervous system)." Psychological Review, 62, 243-254, 1955.

HOLDING, D.H. Principles of training. London: Pergamon Press, 1965.

HOLT, A., THORPE, J., HOLT, L. "Two methods of teaching beginning swimming." Research Quarterly, 41, 371-377, 1970.

HOLT, J. How children fail. New York: Dell, 1964.

HOLT, J. How children learn. New York: Dell, 1967.

HOUGH, J.B. "An observation system for the analysis of classroom instruction." In: Interaction analysis: Theory, research, and application. E.J. Amidon and J.B. Hough. Reading, Massachusetts: Addison-Wesley, 150-157, 1967.

HOWELL, M.L., MONCRIEFF, J., MORFORD, W.R. "The learning rate of beginning swimmers: Age and six differences, distributed versus massed practice." Cahper Journal, 28, 22-23, 1962.

HUNT, D.E. "A model for analyzing the training of training agents." The Merrill-Palmer Quarterly of Behavior and Development, 12, 137-156, 1966.

HUNT, D.E., JOYCE, B.R. "Teacher trainee personality and initial teaching style." American Educational Research Journal, 4 (3), 253-259, 1967.

JOYCE, B.R., HODGES, R.E. "Instructional flexibility training." The Journal of teacher education, 17, 409-415, 1966.

JOYCE, B.R., HAROOTUNIAN, B. The structure of teaching. Chicago: Science Research Associates, 1967.

KAGAN, J. "A developmental approach to conceptual growth." In: Analysis of concept learning. Edited by H.J. Klausmaier and C.W. Hains. New York: Academic Press, 97-115, 1966.

KAY, H., DODD, B., SIME, M. Teaching machines and programmed instruction. Baltimore: Penguin Books, 1968.

KAYE, R.A. "The use of a waist-type flotation device as an adjunct in teaching beginning swimming skills." Research Quarterly, 36, 277-281, 1965.

KERLINGER, F. "Research in education." In: Encyclopedia of educational research. Edited by R. Ebel. Chicago: Rand McNally, 1127-1144, 1969.

KERSH, B.Y. "The motivating effect of learning by directed discovery." Journal of Educational Psychology, 53 (2), 65-71, 1962.

KRUGER, L.M. "An experimental study of two methods of orienting beginning swimmers relative to deep water fear." Unpublished Master's Thesis, The University of California, 1954.

LA PORTE, W.R. The physical education curriculum. Los Angeles: The University of Southern California Press, 1955.

LAWTHER, J.D. The learning of physical skills. Englewood Cliffs, New Jersey: Prentice-Hall, 1968.

LEVY, J. "Risk taking and ability opponent strategy as a function of achievement motivation." Cahper Journal, 39, 15-20, 1973.

LEWELLAN, J.D. "A comparative study of two methods of teaching beginning swimming." Unpublished Doctoral Dissertation, Stanford University, 1951.

LOCKE, E.A. "Motivational effects of knowledge of results: Knowledge or goal setting." Journal of Applied Psychology, 51 (4), 324-329, 1967.

LOCKE, E.A. "Toward a theory of task motivation and incentives." Organizational behavior and human performance, 3, 157-189, 1968.

LOCKE, E.A., BRYAN, J.F. "Cognitive aspects of psychomotor performance: The effects of performance goals on level of performance." The Journal of Applied Psychology, 50, 286-291, 1966.

LOCKE, E.A., BRYAN, J.F. "The directing function of goals in task performance." Organizational behavior and human performance, 4, 35-42, 1969.

LOCKE, L.F. "Movement education: A description and critique." In: New perspectives of man in action. Edited by R.C. Brown, Jr. and B.J. Cratty. Englewood Cliffs, New Jersey: Prentice-Hall, 200-266, 1969.

MALMO, R.B. "Activation: A neurophysiologican dimension." Psychological Review, 66, 367-386, 1959.

MACKENZIE, M., SPEARS, B. Beginning swimming. Belmont, California: Wadsworth, 1963.

MARSHALL, J.A. "The effect of using artificial supports as aids in teaching beginning swimming." Unpublished Master's Thesis, Utah State University, 1957.

MAYBERRY, J.E. "A study of current theories and practices in teaching beginning swimming." Unpublished Master's Thesis, Ohio University, 1959.

MEAD, M. Growing up in New Guinea. New York: Dell Publishing, (1930) 1968.

MEDLEY, D.M., MITZEL, H.E. "Measuring classroom behavior by systematic observation." In: Handbook on research in teaching. Edited by N.L. Gage. Chicago: Rand McNally, 274-328, 1963.

MERRILL, M.D. (Ed.). Instructional design: Readings. Englewood Cliffs, New Jersey: Prentice-Hall, 1971.

MOHR, D.R., BARRETT, M.E. "Effect of knowledge of mechanical principles in learning to perform intermediate swimming skills." Research Quarterly, 33, 574-580, 1962.

MONCRIEFF, J., MORFORD, W.R., HOWELL, M.L. "Acquisition of elementary swimming skills." Research Quarterly, 33, 405-409, 1962.

MORRIS, D. Swimming. London: Heinemann Educational Books, 1969.

NATIONAL SAFETY COUNCIL. "Accident facts." Chicago: National Safety Council, 1959.

NIEMEYER, R.K. "Part versus whole methods and massed versus distributed practice in the learning of selected large muscle activities." 62nd Proceedings Annual Meeting of the College Physical Education Association 1958. Washington: N.E.A., 122-125, 1959.

NOWLIN, M.R. "Study of the correlations between the rate of learning to swim in deep water." Unpublished Master's Thesis, Wayne State University, 1936.

ORRRC. Outdoor Resources Recreation Review Commission. Outdoor Recreation for America. A report to the president and congress. Washington: Government Printing Office, 1962.

OXENDINE, J.B. Psychology of motor learning. New York: Appleton-Century-Crofts, 1968.

OXENDINE, J.B. "Physical education." In: The psychomotor domain: Movement behavior. R.N. Singer. Philadelphia: Lea and Febiger, 165-192, 1972.

PAPE, L.A., MEANS, L.E. A professional career in physical education. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1963.

PEAKE, R.A. "A study of the relationship between four factors of individual difference and the achievement of skills in beginning swimming." Unpublished Master's Thesis, Ohio University, 1952.

PECHSTEIN, L.A. "Alleged elements of waste in learning a motor problem by the 'part' method." Journal of Educational Psychology, 8, 303-310, 1917.

PENFIELD, W., RASMUSSEN, T. The cerebral cortex of man: A clinical study of localization of function. New York: MacMillan, 1957.

PIAGET, J. The language and thought of the child. Cleveland: World Publishing, 1955.

PIAGET, J. "The right to education in the modern world." Freedom and culture, UNESCO. London: Wingate, 95-98, 1951.

PRICE, T.D. "Elementary school science: A design for subject matter selection and organization." Unpublished Doctoral Dissertation, Stanford University, 1966.

RIBET, E.C. "Teaching techniques used with fear cases in beginning swimming for college women." Unpublished Master's Thesis, Michigan State University, 1957.

ROBB, M. "Feedback and skill learning." Research Quarterly, 39, 175-184, 1968.

ROBBINS, S.G. "The development of an instrument to analyze teacher behavior in elementary school physical education." Unpublished Doctoral Dissertation, The University of Alberta, 1973.

ROSENSHINE, B. "Evaluation of classroom instruction." Review of Educational Research, 40, 279-299, 1970 (b).

RUHL, B.L. "Experimental study of the relation of personality adjustment of swimming progress of beginners." Unpublished Master's Thesis, Louisiana State University and Agriculture and Mechanical College, 1950.

RUSHALL, B. "Personality profiles and a theory of behavior modification for swimmers." Swimming Technique, 4 (3), 66-71, 1967.

RYAN, D. "Effects of stress on motor performance and learning." Research Quarterly, 33, 111-119, 1962.

SCHACHTER, S., SINGER, J.E. (1962) "Cognitive, social, and physiological determinants of emotional state." In: The cognitive processes: Readings. Edited by R.J.C. Harper *et al.* Englewood Cliffs, New Jersey: Prentice-Hall, 426-449, 1964.

SCOTT, M.G. "Learning rate of beginning swimmers." Research Quarterly, 25, 91-99, 1954.

SEAGOE, M.V. "Qualitative wholes: a re-evaluation of the whole-part problem." Journal of Educational Psychology, 27, 537-545, 1936.

SHARMAN, J. Modern principles of physical education. New York: A.S. Barnes, 1937.

SHARPE, C.H. "A comparative study of the whole versus the part method in teaching the breast stroke." Unpublished Master's Thesis, Florida State University, 1957.

SHEARD, J.E. "The relative effectiveness of teaching two basic swimming strokes by two methods to non-swimmers." Unpublished Doctoral Dissertation, Indiana University, Bloomington, 1959.

SILVIA, C.E. Manual and lesson plans for basic swimming. Springfield: C.E. Silvia, 1970.

SIMON, A., BOYER, G.E. (Eds.). Mirrors of behavior II: An anthology of observation instruments, Vols. A and B. Philadelphia: Research for Better Schools, 1970.

SINCLAIR, A., HENRY, W. Swimming. London: Longmans, Green, 1894.

SINGER, R.N. Motor learning and human performance: An application to physical education skills. New York: The Macmillan, 1968.

SKINNER, B.F. Science and human behavior. New York: Macmillan, 1953.

SKINNER, B.F. The technology of teaching. New York: Appleton-Century-Crofts, 1968.

SKINNER, B.F. "The technology of teaching." Proceedings of the Royal Society, B, 162, 427-443, 1965 (a).

SKINNER, B.F. "Why teachers fail." The Saturday Review, Oct. 16, 1965 (b).

SMITH, M. "Summary of factors affecting motion of a swimmer." Unpublished mimeographed paper. University of Alberta, 1967.

SMITH, M. "Teaching beginning swimming." Unpublished mimeographed paper. University of Alberta, 1970 a.

SMITH, M. "Teaching beginning diving." Unpublished mimeographed paper. University of Alberta, 1970 b.

SMITH, M. "Progressions for developing the standard swimming strokes." Unpublished mimeographed paper. University of Alberta, 1970 c.

SMITH, M. "Teaching methods for swimming instructors." Unpublished mimeographed paper. University of Alberta, 1970 d.

SMODE, A.F. "Learning and performance in a tracking task under two levels of achievement information feedback." Journal of Experimental Psychology, 56, (4), 297-304, 1958.

SPENCE, J.T., SPENCE, K.W. "The motivational components of manifest anxiety: Drive and drive stimuli." In: Anxiety and behavior. Edited by: C.D. Spielberger. New York: Academic Press, 291-326, 1966.

SPORT PARTICIPACTION CANADA. "Physical fitness ..? Who needs it! ... A case for regular exercise." Publicity brochure, Sport Participaction Canada, 1972.

STEBBINS, R.J. "A comparison of the effects of physical and mental practice in learning a motor skill." Research Quarterly, 39 (3), 714-720, 1968.

STEPHENS, G. "An investigation of child psychology in the teaching of beginning swimming to children." Unpublished Master's Thesis, Fresno State College, 1955.

STULL, A.G. "Relationship of quantity and distribution of practice to endurance, speed and skill development by beginners." Unpublished Doctoral Dissertation. Pennsylvania State University, 1961.

TABA, H. Curriculum development: Theory and practice. New York: Harcourt, Brace and World, 1962.

THOMAS, R. Swimming. London: Sampson, Low, Marston, 1904.

TINKER, B.M. "A comparison of two methods of teaching treading to beginning swimmers. Unpublished Master's Thesis, State University of Iowa, 1946.

TORNEY, J.A. Swimming. New York: McGraw-Hill, 1950.

TORRANCE, E.P. "Seven guides to creativity." Journal of Health, Physical Education, and Recreation, 68, 26-27, 1965.

TRUAX, C.B., CARKHUFF, R.R. Toward effective counseling and psychotherapy: training and practice. Chicago: Aldine Publishing, 1967.

TURNER, R.L. "Pupil influence on teacher behavior." Classroom Interaction newsletter, 3, 5-8, 1967.

VAN VLIET, M.L., HOWELL, M.L. Physical education activities for secondary schools. Toronto: Macmillan, 1967.

WALLACE, L. "Swim fins as an aid in teaching the flutter kick for the front crawl." Unpublished Master's Thesis, Washington State University, 1960.

WHITE, R.W. "Motivation reconsidered: the concept of competence." Psychological Review, 66 (5), 297-332, 1959.

WHITING, H.T.A., STEMBRIDGE, D.E. "Personality and the persistent non-swimmer." Research Quarterly, 36 (3), 348-356, 1965.

WITHALL, J., LEWIS, W.W. "Social interaction in the classroom." In: Handbook of research on teaching. Edited by N.L. Gage. Chicago: Rand McNally, 683-714, 1963.

WOLPE, J. Psychotherapy by reciprocal inhibition. Stanford California: Stanford University Press, 1958.

APPENDIX A

TEACHING BEGINNING SWIMMING

TEACHING BEGINNING SWIMMING

Murray Smith
University of Alberta, Edmonton
January, 1970

The following material relates to instructing classes of children between 6 and 12 years of age. Comments will be made later as to modification for older pupils. Experienced instructors will be able to work effectively with up to 20 beginners but less experienced instructors will be best with from 8 to 12 pipuls per class. A desirable class size is somewhere between 8 and 16 children. Many programs would benefit by adjusting enrollments so that less experienced instructors teach smaller classes with few slow learners or behavior problems. This would not only result in success for more children but decrease the drop-out rate of young instructors resulting from frustration in the face of unnecessarily difficult working conditions.

Water temperature as close to 80°F as possible (air temperature in indoor pools about 85°F) and about chest-depth water for the average class member are ideal. There should also be some water between 4-1/2 and 12 feet in depth (ideally 8 to 10 feet). If available, shallow water between 1 foot and 2-1/2 feet can be put to good use. It is understood that conditions across Canada vary greatly. In many cases, instructors will use their own ingenuity and energy to do effective work under far from ideal conditions. Equipment that can be useful includes standard flutter boards (light plastic foam ones are best), various sized air-filled balls, empty plastic bottles (water tight) from one to two quarts in size, hoola hoops, and a small paddle.

Under near optimal water and air conditions, even six or seven year olds can remain interested and work effectively for up to an hour or more. Practical considerations and less ideal conditions usually limit lesson length from an absolute minimum of 30 minutes to a desirable 45 minutes.

It is important to emphasize that the major objective of this approach to teaching is to give children meaningful experience that will assist them in learning to swim. The activities outlined below centre around the three most important physical aspects of beginning swimming: buoyancy, body shape and position, propulsion. The immediate objectives are: 1) to provide an experience the child will want to repeat; 2) to get the child swimming and diving as soon as possible so that success will motivate him; 3) recognizing how learning really occurs we set out to develop an ability to swim some distance first and as this progresses develop skill in the standard swimming strokes. Perhaps the most difficult change in instructor attitude centres around the realization that insisting on a particular stroke from the very beginning is like forcing an infant to attempt to walk upright with balance and control without ever allowing him to crawl and then make his own attempts to walk. Skill in walking, swimming, piano playing, reciting poetry, or anything else, appears after considerable practice, undue emphasis on it in the wrong way, too early in the learning process is very damaging. Emphasis will be on skilled performance but it will be on skill in doing something the child (or older learner) is capable of doing now.

The best preparation for instruction is to have had a number of pleasant experiences with water. Fun in the bath, happy afternoons at the beach or pool, playing in the spray from a garden hose or splashing in a backyard plastic pool. These things kindle a strong desire to learn to swim. If such experiences result in an ability to put the face in the water and control breathing while submerged then the situation is at its best. When parents ask how to get their children started in swimming, the answer should be: See that they have a chance to get used to water as something enjoyable. Too many children are taken to the beach or pool and forced to do things which frighten them before they have had a chance to get used to the water. The best thing that could happen in many learner programs would be to provide water time for orientation and not to attempt to teach children at all until they have become adjusted to water.

The sequence that follows is not a rigid system but an attempt to put into practice the best ideas available on the subject of learning physical skills. Many if not most of the ideas are old friends. The only really new thing is the emphasis placed on them and the conditions under which the children practice. Many old procedures are missing because they have been shown to either simply waste time or in some cases, even inhibit learning. The following material includes a brief summary of the steps for beginners, then a set of tips for teaching each step, a procedure for deep water orientation, and finally some suggestions for teaching older learners (teen-age to adult).

SEQUENCE OF STEPS FOR INSTRUCTING BEGINNERS

Beginning swimming will be divided into eight phases:

1. Exploration and orientation to water.
2. Buoyancy - the water supports the body.
3. Body shape and position while floating.
4. Gliding face down and on the back - including changes in position, front to back and back to front.
5. Propulsion - fundamental swimming with major emphasis on arm actions assisted by a gentle kick, face down and on the back.
6. Taking weight on the hands - leading to underwater swimming, diving from the side, and surface diving.

7. Turning while swimming to return to starting point.
8. Distance swimming.

An explanation of each phase follows below after which some detailed tips for teaching each phase are outlined.

1. Exploration and Orientation. Unhurried experience in the water during which the pipul not only gets used to buoyancy and starts to develop breath and vision control, but gains confidence that the instructor can be trusted.

2. Buoyancy. Experience with the face that water supports whatever is submerged in it. Attention is directed to the buoyant effect on the learner's body and on several common light objects.

3. Body Shape and Position While Floating. Experience is gained floating in a relaxed, loose body shape, face down. The pupil learns to change this loose shape to the familiar long stretched, streamlined body shape with arms in front, used in swimming face down. The loose relaxed shape while floating on the back is practiced and then changed to a long stretched body shape with arms at sides. In both front and back float positions, the head is held in line with the trunk and most if it is underwater.

4. Gliding While Face Down and On the Back. After a gentle but firm push off along the surface the learner experiences gliding forward, long and stretched, face down, eyes open, arms extended forward. Once this face down glide is possible with body stretched, the same thing is attempted on the back but with arms at the sides. It generally takes considerably longer to learn to do the back float well. When both floats are possible the learner practises changing body position from front to back without standing up. Then he practises the change from a back float to a front float. As the change in body position is made, the arms are also moved so that when face down, they are extended forward, on the back they are at the sides. The arms are kept under water, quite close to the body during the changes.

5. Propulsion. Starting in the front glide, as above, the learner attempts to use his hands and arms so as to push water back in order to move ahead. The body remains stretched, only the arms and the hands move. He may use either a simultaneous arm action (both arms move at once), or an alternate arm action (first one arm, then the other), as he chooses. Then he tries it while doing a back glide. On the back, only the simultaneous arm action should be used because an alternate arm action produces an awkward fish-tail motion. Hands and arms are kept underwater throughout and care is taken during the

return of the hands not to push water forward. After stroking, the hands should sneak back, fingers leading.

A gentle flutter-type kicking action is allowable from the beginning of practice in propulsion as long as it does not inhibit forward movement. If kicking does *detract* from either body position or forward progress, it should be left out until later. Once the learner can travel up to 20 or 30 feet non-stop he should be *required* to incorporate a gentle kick in both body positions. At this time also the learner should be *allowed* to *begin* a distance swim in *either* front or back position but *required* to change to the other body position and continue swimming before putting the feet down. While face down the same flutter-type kick is used, with both simultaneous and alternate arm actions. During early stages of swimming most children will choose to use the simultaneous arm action. When the learner is able to swim non-stop 20 to 30 feet, another restriction is gradually added; he is *required* to practice the *other* style of arm action. From this point on, he practises both types of arm actions.

In summary, early swimming attempts will be in both front and back body positions. The child is free to choose either a simultaneous or alternate arm action while face down. On his back, he will use a simultaneous arm action and in both body positions a gentle flutter-type kick. Emphasis is on keeping a long, stretched shape and on easy motions rather than rapid thrashing. Once he is able to swim about 20 feet by his own preferred method face down and can do about the same distance on his back he is *required* to make at least one change from front to back (or vice-versa) during most swims.

6. *Taking Weight on the Hands.* Standing in about chestdeep water, the learner attempts to touch the floor of the pool with one hand. He is free to use his own method. Then he tries to touch the floor with both hands. Next, to keep both hands on the floor for several seconds. He may sit or squat, his feet and lower legs may be in the water or out of it. He tries to find a way that is possible for him. Finally the class is *directed* to rotate forward, try to get the feet out of the water and stand on the hands. As they get better they attempt to maintain a long stretched shape with weight on the hands. Once most learners can do this fairly well they are ready to begin diving from the side, and also to start surface diving. Besides being a lead-up to these dives, this practice gives valuable experience with buoyancy, with breath control, and in getting used to unusual positions underwater. A detailed description of further progressions is to be found in the material on *Teaching Beginning Diving*.

7. *Turning While Swimming*. Once learners can swim about 20 to 30 feet non-stop they should push off and swim a short distance *either* face down or on their back and then *witout putting the feet down on the*

floor, turn and swim back to the starting point. This may involve a change of body position from front to back, or back to front, or it may not. Later on they can be required to do it in a certain way if the instructor wishes. The turn may be a U-turn or involve a half somersault. A common way is to swim out on the back, sit up and stretch out face down to return. This step has obvious safety value in returning to a boat or dock after falling into deep water.

8. Distance Swimming. Part of every lesson after the first one, should be spent swimming for distance. If working across the pool, the class should push off from the side (in waves if space requires it) and each one swims as far as he can before stopping. This may be only 4 or 5 feet at first. When an individual must stop for air he stands up, does not walk, catches his breath and continues when ready. Each one keeps track of the number of stops he makes in a width (or any given distance). If he makes 8 stops in his first width and only 7 or 6 in his second he is aware of his own progress. Knowledge of his own results combined with encouragement and tips from the instructor provide effective motivation. Each time he sets out to swim during a lesson he should try to go farther (or make fewer stops) than the last time. He competes with himself. Competition with classmates at this time is destructive and should be actively discouraged. It is worth repeating that from the second class on, the beginners should spend a good deal of time in distance swims of this type. Three widths (or two lengths) swims in which the children do not hurry or race but concentrate on extending their own best distance record, each one stopping only when he must. During these swims the children are sometimes face down, sometimes on the back, using their preferred arm action with a gentle kick. They change body position once or several times between stops.

When swimming on the front the face is in the water to maximize buoyancy and maintain good body position. If some want to attempt to breathe while swimming face down, they should be allowed to as long as the head is lifted or turned rather quickly so that the body position is not destroyed. Most will develop skill in catching up on breathing while on the back and then rolling over to continue face down. In this way, a fair number of children will be swimming most of a length (if the pool permits) or a full width non-stop in the first few lessons. As soon as most class members can swim about 30 feet face down and about the same distance on the back, the instructor can begin to refine the standard swimming strokes out of their fundamental swimming.

TEACHING TIPS FOR BEGINNER PHASES

The instructor is encouraged to use his own ingenuity in leading the class through the eight phases described above. Some suggestions that experience has proven to be useful are outlined below.

1. Tips for Exploration and Orientation

1.1 The instructor should be prepared to enter the water whenever it appears helpful. Some will be in the water a good deal during early lessons while others may be in seldom, if ever. Each individual should do what he thinks works best for him. Encouragement can be given very effectively from the side in some cases, in others the instructor will feel a need to be in the water for best results. Beyond the first few lessons, there is seldom a need to be in the water since class mem-ers are quite independent and the instructor can see and help best from the side.

1.2 Pair children off as has been done for years. It is helpful not only in terms of safety but also for mutual encouragement and fun. Simple activities such as: moderate bouncing; follow-the-leader in pairs; tag in pairs (not mass tag); and playing catch with a ball in pairs can get the class started. Hoola hoops can also serve to get children playing and hence relaxed and ready for instruction. For example, one of many simple games requires one ball and one hoop per pair. One child stands inside the hoop, and the other child tries to get the ball into the hoop by pushing it underwater so it pops up inside the hoop. The child in the hoop is free to move around keeping the hoop on the surface. The children can make up their own simple games. Confident children enjoy the games, anxious children have fun and learn to relax and enjoy the water without pressure.
Re-arrange some pairs if this appears useful. Before proceeding to formal instructions try to think of simple activities that require going under the surface. Some suggestions; retrieve a puck from the floor; float a hoop on the surface, without lifting it and holding a partner's hand if desired, duck under to come up in the hoop; wash the face with both hands; hold the face in water held cupped in hands; put the face lightly in the water.

At this stage the instructor should present activities with phases such as, "See if you can do so-and-so," or possible, "Try doing this". Without rigid compulsion many anxious children (and remember these are the ones we have trouble with) may watch for a few moments but then join in. When most children are displaying relatively natural behavior then proceed to phase 2.

2. Tips for Buoyancy

During the first lesson try two or three of the items below. In later lessons review these quickly and go on to others. Add items of your own and invite suggestions from the class.

2.1 Crouch in the water so the chin is on the surface while the head is erect. Hold the arms out away from the body, for balance, or hold partner's hands. Keeping the chin on the surface, stand on one foot. Still with chin on the surface, rise up on the big toe and balance there. One cannot do this on land. Ask, "Can you feel the water hold you up? The water will hold you up if you get down into it."

2.2 "Hold your partner's hands if you like. Crouch as before with the chin on the surface and take a breath. Gently tip forward, dropping the head face down, and let the water support your weight. Look down at the bottom, let your arms and legs hang loosely and try not to move them. Do not lift the feet, just tip forward. Let the water place your legs and feet where it will, do not fight the water. Start with this gentle tip forward, not a jump up which is followed by a splash and sinking."

Encourage children to try it alone or holding their partner's hands but anxious children should be allowed to use a ball, plastic bottle, or kick board for support.

2.3 Each child is given a buoyant object. The instructor directing the activity says something like, "Stand in the water and press the buoyant object down under the surface. Feel the water push up. Push it down a couple of inches below the surface, try to make it jump up out of the water. (With practice, an air filled ball, the best size is from 4 inches to 8 inches in diameter, will jump up at least a foot.)

"You push down. What makes the ball jump up? The water must push it up. Trade with your partner and get a ball or object of a different size. Repeat. Can you feel the difference? The larger ball or bottle is harder to push down. If your lungs are full of air (instructor inhales) your chest is bigger and the water pushes up harder on you. It holds you up better. Always try to keep your lungs full so you will stay up better. Later you will learn how to breathe while swimming."

2.4 "Crouch as before with chin on the surface. Take a breath, gently tip over backwards and let the water support your weight. Look up at the ceiling or sky. The ears should be under water, the face above. Do not lift the feet. Let the arms and legs hang loose, relaxed, and still. Again it is important not to jump up and fall over but to tip over gently.

In this way, most pupils will not sink under the water completely, at any time. If a good breath has been taken first, the face will remain above the surface. Fearful children should be allowed to hold buoyant objects to the chest or to get support from their partner if necessary.

2.5 The instructor floats on his back as above. He exhales forcefully through his mouth and sinks to the bottom. This illustrates again the importance of keeping air in the lungs. The class may want to try this but several will likely not want to and should not be required to.

3. Tips for Body Shape and Position

3.1 "Crouch as before chin on surface, tip forward in a loose relaxed float. Flaot a moment, then stretch out and make yourself as long as you can. Be straight but not too tense. Only be stiff enough to keep the long shape without the water changing it. Loosen up your muscels until you can just barely keep the shape you want. If you feel like you will tip or roll over, move your hands and feet about a foot apart and loosen up especially in the shoulders. Do not fight the water, bob like a cork but keep the body straight. Again, do not lift the feet up, let the water set them at their natural floating angle."

With some individuals the tops of the toes will be on the bottom. Leave them there. If they are lifted they will simply sink anyway. The backs of the hands and forearms are just under the surface. The body is straight at the waist, face down, eyes open looking at the bottom. Allow buoyant aids.

3.2 "Crouch as above but this time gently tip over backwards in a loose relaxed float, pause a moment, then stretch out, body straight at the waist, with your arms at your sides. Do not lift the feet, let the heels touch the bottom if they will. Head back so that ears are under water."

Some children will float with the face out (but ears underwater) and the heels on the floor. This is quite alright as long as the body is straight at the waist. Again buoyant aids are allowable. If the instructor encourages timid children to try things without an aid they will soon give them up. If he attempts to force the learner to do without an aid that is still needed he will seriously reduce his chances of helping the pupil advance.

4. Tips for Gliding and Changing Body Position

The front and back glides have been adequately described. Review pages 2 & 3.

4.1 When both front and back glides are being done reasonably well, demonstrate a push off in a front glide and roll like a log to the back. As the roll to the back takes place bring the arms down so that they are at the sides in the back float. Ask the class to try it without much explanation as to how it is done. Most will find a reasonably good method within several trials. Be sure the head is not lifted as the body rolls over. The loss of buoyancy when the head is lifted results in sinking. Also keep the arms under water throughout. Help children having trouble or let them watch classmates for ideas. To illustrate the importance of not lifting the head, do this for the class: The instructor or a class member shows a good motionless back float, ears under, face above the surface. Lift the head out of the water and make no other movement. The body will sink due to loss of buoyancy.

4.2 From a back float with body straight, arms at sides, roll like a log to the face down position and as the roll occurs reach the arms forward to the usual front float position. After rolling hold still in the face down position for a few moments. The roll in all cases should be at moderate speed and controlled rather than a violent twist. Take it easy.

5. Tips for Propulsion - Fundamental Swimming

It is usual that beginners are instructed to first propel themselves with a kicking action. Quite likely this is due to the face that, on land, the legs are the prime movers. But in the water the arms are known to be far more effective than the legs. For this reason, early practice in propulsion in the present method is in using the hands and arms. Besides being the prime movers in the water they are much more skillfull and sensitive than the feet.

The more usual emphasis on the kick coupled with large amounts of land and rail drill in vigorous kicking practice often results in a kick that can only be maintained for a very short time and this prevents the learner from developing the ability to swim any appreciable distance.

5.1 When the class can do the front and back glide reasonably well and most can change from front to back and back to front they are ready to go on to propulsion. Kneel at the side of the pool or dock and go through a paddling action with a real (or imaginery) paddle. Ask the class which way the canoe or boat would go if you paddled like that. When they tell you, emphasize that you push water back to go ahead. Ask the class to stretch out in their front float and keeping the hands under water all the time, use the hands and arms to push water back towards the feet. Without further explanation tell them to try it. As they practise, stress the importance of keeping the long stretched body position as they use their hands. The face must be in the water to maximize buoyancy and maintain good body position. Each may choose his won style, either simultaneous or alternate arm actions. (Note that the class need only stop activity for 30 seconds or less before they are practising propelling themselves. They do not leave the water for a lengthy demonstration or land drill.)

This will be a ~~good~~ time for the instructor to re-read the description of propulsion on page 3.

5.2 It is well established that repetition is required to consolidate new learning. The children must be allowed adequate time to work on the skill of propulsion. All of this practice should be in the water with only those breaks required for resting to catch their breath and for the instructor to re-emphasize principles. The instructor stresses good body shape (long and stretched), normal head position, easy but firm arm movements. He also stresses a gentle, flutter-type kick once effective arm actions are fairly well established. This is indeed emphasis on skill, but it is realistic emphasis. It is also an example of "whole" learning. The children are doing a "whole" thing in a realistic setting.

5.3 During the second or third lesson in which the class is working on propulsion, the following demonstration will help most of the class to understand propulsion better. Blow up a toy balloon and hold the end closed. Ask the class where the air will go if you let go of the end. Then ask where the balloon will go. Emphasize that the air goes back and the balloon goes forward. The paddle pushes water back and the canoe goes forward. The swimmers push the water back with their hands and feet and they move forward. Ask them to think about pushing water back with the hands while swimming. To push water back the hands should be flat (not cupped) and the palm should be kept close to 90 degrees to the swimmer's line of motion.

5.4 Kneel at the side with the paddle and demonstrate a reverse stroke, pushing water from behind you towards the front of the imaginary canoe. Ask what effect this would have. Stress the importance of sneaking the hands back through the smallest hole in the water they can make, to reduce this negative action to a minimum. Demonstrate how this can be done by turning the paddle so that the edge of the blade cuts the water during recovery.

5.5 Recall that the learners are free to choose between the simultaneous or alternate style of arm action. When most of the class can swim about 20 to 30 feet, focus the practice on three features:

(1) require the gentle kick;
(2) require some practice of the second style of arm action;
(3) require changes in body position from back to front or vice-versa while swimming.

5.6 Encourage attempts to breathe in two ways. First, remind learners that while flat on the back the mouth and nose are free and ask them to try to catch up on their breathing while in that position. Second, the better swimmers should try breathing while face down. Do not confuse them with too much detail about the technique of breathing as done by expert swimmers. Simply indicate they should attempt to blow out under water and then turn the head to one side to try to get some air. As they progress add more detail and refine the action.

5.7 Each person keeps mental records of his own personal best distances. The instructor emphasizes that the learner competes with himself, not his classmates. Racing and other forms of competition between class members must be discouraged. Later on there will be a time and place for playful or more serious competition between children but at this point there is no doubt of its destructiveness.

6. Tips for Taking Weight on the Hands

6.1 Ask the class to try to touch the bottom with one or both hands. If they ask how, tell them to try it any way they like. There is an important reason for this procedure. The class first try it during the first or second lesson. Some children are still unable to or at least anxious about putting the face in the water. Given freedom to do it their own way, some children will be able to do it by sitting down or squatting and it may result in the first real success for them. We must not underestimate the power of success as a motivator, or the power of failure as an inhibitor to learning.

6.2 Ask those who cannot get down to the floor even though they try, what it is that prevents them from doing so. (On one such occasion a seven year old boy said, "The gravity of the water won't let me.") Stress the feeling of the upward push of the water that keeps them from the bottom. For many this is the clincher that water really does hold people up.

6.3 After 3 or 4 trials in their own way, many learners will already be rotating forward and going into a handstand. But we do not begin by asking the class to do a handstand because at least half the class would reply that they could not do it. By moving from an easy, familiar item such as squatting down, to a simple rotation forward to get the hands on the floor, a much higher percentage of the class experience success. There is a big difference in the effect on the bottom half of the class between asking them to do a handstand and asking them to try to rotate forward, put both hands on the bottom, and try to get the legs out out of the water.

6.4 The instructor is referred to the section on Teaching Beginning Diving for further details on progression in teaching underwater swimming and diving.

7. Tips for Turning While Swimming

The only tip required here is to stress that the instructor should allow the children to attack the problem on his own. Ask him to attempt to push off from the wall and swim a few strokes either face down or on the back, then return to the starting point doing his best not to touch the bottom. Make clear what they are trying to do and leave them the reasonable challenge of trying to find a way. Later they can be required to try other ways. It will be useful to discuss the value of this skill when they are resting or during a water safety session.

8. Tips for Distance Swimming

The instructor should re-read the material on pages 4 and 5 where distance swimming is discussed.

8.1 During swimming practice, it is important to have learners travelling along parallel lines to minimize collisions and interruptions. In pools where the whole main tank is shallow water (there are very few of these unfortunately) a good deal of the distance swimming should be done over the length of the pool. Otherwise it must be done in widths or, worse yet, partial widths, depending on how the pool is divided for classes.

Instructors and program organizers should give some thought as to how best to divide the pool so that there will be the best chance possible to develop distance swimming ability. In any event, space should be arranged so there is at least a 30 foot distance over which the class can swim back and forth.

8.2 A real advantage of spending up to half the beginner's class time on distance swimming is that fast learners can get on with it and the instructor can give attention to those who need it. It is a simple way to increase greatly the individual attention given.

8.3 Variety can be added to distance swimming by changing the conditions. Some suggestions follow:

(a) Swim as far as possible by any combination of body positions.
(b) Set a new personal record face down.
(c) A new record on your back.
(d) Cover a fixed distance (say 4 widths) with fewer stops than ever before. Later, increase to 6 widths or more.
(e) How far can you swim in 5 minutes and how many stops are required? Later, increase the time to 7 or 10 minutes.

Improvement will be evident in either increasing the distance or decreasing the number of stops made.

The instructor will be able to think of other variations. The above is not to suggest that the children are forever trying to set new records but only that fairly regularly their attention is directed to their own improvement in swimming a distance in a variety of ways.

About the Development of Skill

After 7 or 8 lessons in which the items above are worked on most beginners will possess considerable skill. It is not the skill of the experienced swimmer but skill in fundamental propulsion in the water. They will be able to maintain a stretched body position while moving along either face down or on the back. Actions of the limbs will indicate a fair degree of control and efficiency rather than frantic thrashing. Most will be able to do a reasonable dive from the side. Each person is aware of the distance he can swim and he is ready to begin work on the standard strokes.

Somewhere between lesson 4 or 5 and lesson 7or 8, the class will be ready for orientation to deep water.

ORIENTATION TO DEEP WATER

This can be a challenge to the beginning instructor but if a sensible sequence is followed, it usually works out well. The more experienced instructor may want to take his beginners to deep water earlier than the novice. In any case the class is prepared to begin deep water orientation when all but possibly one or two can swim about 20 to 30 feet. The first experience should occur about mid-way through the lesson after a thorough review of swimming techniques. A review of a fully relaxed, loose, float in shallow water is an effective thing to do just before leaving the shallow water. The steps that follow work well but the experienced instructors will have proven ideas to add. Three important principles should be observed no matter what progression is followed:

(1) Many students will be extremely tense and the instructor should be understanding and considerate. Sensible use of humor can help break the tension.

(2) Each new step should be a simple extension of what has gone before.

(3) No pupil should be forced to join in against his will.

Matter-of-face encouragement will win over many fearful learners when they witness the success of classmates, as long as they are not ridiculed for their admission of fear. The only solution for particularly tense children is patient extra help outside of class time. Usually one or two ten-minute sessions will get them over this difficult personal hurdle.

First a group method of orientation will be outlined and then a second method based on a more controlled approach will be described.

Matter-of-face encouragement will win over many fearful learners when the witness the success of classmates, as long as they are not ridiculed for their admission of fear. The only solution for particularly tense children is patient extra help outside of class time. Usually one or two ten-minute sessions will get them over this difficult personal hurdle.

First a group method of orientation will be outlined and then a second method based on a more controlled approach will be described.

1. If no permanent hand grip (gutter lip, pipe, etc.) exists a temporary arrangement that affords a secure grip while children are in the water will be a real benefit. Demonstrate safe entry into deep water by sitting on the edge of the pool and placing both hands on the deck to the same side of the body. Lean most of your weight onto your hands, pivot your hips as you turn to face the pool wall and lower yourself into the deep water under control.

2. The children, paired off, enter in the same way and holding the gutter or hand grip with both hands they submerge to the chin. Gentle bobbing up and down as the instructor offers encouragement is useful here.

3. Once they are beginning to get used to the deep water ask them to face the wall, hold on firmly but not rigidly with both hands, let the legs hang at their natural floating angle, put the face in and float without letting go, as they did in the shallow water a few moments earlier. Repeat this several times. Then ask them to try it holding on with one hand if the hand grip is suitable.

4. Let us refer to the partners as A and B. A and B face each other in the water, B holds the wall grip with only his right hand, B with only his left. They join free hands. While maintaining their grip on the wall and holding hands, they put their faces in and float. Ask them to look at the bottom or at their toes. Repeat several times. Now, A keeps his grip on the wall and on B's one hand and watches while B floats. As B floats, he lets go of the wall. Be sure their joined hands are just under the surface. They A tries this while B holds his hands and watches him.

5. Next, B repeats the float in #4 above. Once B is floating, holding only A's hand he lets go of A's hand and floats freely for a few moments. A watches him closely and takes his hand after several seconds. Repeat several times and have A float while B guards him.

6. Having floated in deep water the children should try a glide. This can be done by having the instructor tow them along the side with a reaching pole, one at a time, or by having them line up in the water 6 to 8 feet from the corner of the deep pool and push off diagonally towards the other wall.

7. Next the class can attempt a swim of greater distance in deep water. Ask the class, "Who would like to try to swim across the pool?" Ask for volunteers and offer encouragement with no badgering of timid learners. Let the class attempt, one by one, to swim across the pool within 4 to 6 feet of the side. Let them choose to go face down or on the back and encourage (but do not insist on) changing positions, front to back or vice-versa, during the swim. The instructor follows each child in turn and assists with the reaching pole if it is required.

8. An important demonstration can be made at this point. The instructor (or demonstrator) jumps vertically into deep water, underwater he waits for buoyancy to return him to the surface. He surfaces with body straight, arms at sides, popping through the surface at 90 degrees.

His buoyancy may carry hom out of the water to about chest level. His limbs are motionless. Loss of buoyancy results in his sinking well below the surface. Next he repeats the vertical entry but as he surfaces pitches face down then begins a gentle arm action and kick to the side. By pitching forward as he breaks the surface, he does not experience loss of buoyancy and thus remains at the surface. Stress this as the way to surface without sinking. Also stress that in case of trouble do not lift up the head since this will result in both loss of buoyancy and loss of air in attempting to breathe. Sinking is then inevitable. Remain in the swimming position, head down and hold up one hand to signal for the teaching pole.

9. A deep water entry can be tried by those who feel ready. ("Who wants to dive or jump in and then swim to the side OR start across the pool close to the end?") Soon, the more timid learners will follow. If some children are reluctant to jump into deep water ask them to lower themselves into the deep water and face the wall of the pool while holding on. Then ask them to put both hands on the deck, pull themselves up, out of the water to about the waist, let go and slide under. The instructor stands ready to help with the pole, or assist from the water. The instructor should remember that if a reaching assist is needed, he acts cooly and does not panic. The class will respond with a matter-of-fact reaction. If he panics, they panic.

10. Once learners can enter deep water, surface as described, level off and swim a width by their own preferred stroke, they should incorporate a change of body position while swimming.

11. Diving entries should be encouraged for deep water swims and if a low board is available, jump or dive entries from it should also be open to those who are ready. Experienced instructors often have beginners who were reluctant to submerge in lesson one, going off the low board in lesson four or five. But this should not be rushed. The instructor should proceed at a pace he feels comfortable with.

12. Swims from dive, jump or push-off, from deep to shallow water, parallel to the side of the pool, are exciting challenged for beginners. The importance of allowing learners to choose their own mode of entry during the early deep water experience cannot be over-emphasized. After several entries of their own choice, the instructor may well begin to require specific entries.

13. If the instructor is not confident with the whole group in the deep water, he may use a technique in which one learner at a time enters. Lack of a safe gutter lip or other type of hand grip may also rule out the group orientation technique. When this approach is used the waiting class members should be encouraged to use their towels to maintain comfort. Learners who are both cold and fearful are in

danger of a damaging experience in deep water. A useful individual technique is to have learners climb down a ladder or steps in the deep end, take hold of a teaching pole held by the instructor and practise floating in place and gliding while holding the pole. Steps 1 - 12 above can be modified to this individual approach at the instructor's discretion. Another possibility is to work with half the class at a time as described in the first twelve steps.

TEACHING TEEN-AGE AND ADULT BEGINNERS

Experience has indicated only three significant differenced between young children and the teen-age to adult beginners in the use of this approach.

1. With adults especially, one often encounters the learner with a long history of fear of the water. Patient understanding and reasonable pressure to move on from phase to phase pay off. It is often helpful to get these learners to state the cuase of their concern. Experience with and patient explanation of principles will usually help dispell fear. For example, the adult who is afraid of sinking often undergoes a change of attitude when he tries to touch the bottom as required in phase six.

   This activity must be linked to activity in the water. Do not stand around talking about fear. Keep the learner active, usually they prefer the use of an aid and be alert to comment on reasons for whatever successful efforts are made. The one thing they don't need is more discouragement or impatience from the outside.

2. Because older learners have a richer background of experience and understanding this enables use of a wider vocabulary, including more complex words, that get across meaning much more quickly than is the case with youngsters. The instructor might for example talk of "streamlining to reduce resistance" or keeping the hand at "right angles to the line of motion ~~to~~ increase thrust." Choice of words and figures of speech used should be appropriate to the group under instruction.

3. Not only do older learners have a wider vocabulary but they can tolerate more explanation than young children. While explanations should not get too elaborate with even older learners, they can profit from more verbalization without actually experiencing what is being explained. Their past experience either includes what is being explained or they are able to grasp the conditions and predict outcomes more accurately than those under 12 years of age.

APPENDIX B

TEACHING BEGINNING DIVING

TEACHING BEGINNING DIVING

Murray Smith

University of Alberta, 1970

As in many things, some people will learn to dive despite any obstacles placed in their way. This skill can be very difficult for many others who do not learn physical skills easily or where there is an emotional reaction that complicates the learning.

Experience has convinced me that the problems experienced by a surprising number of people in learning to dive are rooted in a well-meaning but poorly designed progression of teaching the skill. Among the important factors that remove or reduce the problems are these:-

1. Diving should begin in waist or chest deep water where the learner experiences a forward rotation about the axis through the hips.

2. Diving should begin (in the water) during the first or second lesson of beginning swimming instruction.

3. Practice should be arranged so that unavoidable errors in learning are not a source of embarrassment or cause for ridicule of the learner.

The two most common errors in teaching diving by standard methods are:-

1. Beginning at a far too difficult level. Sitting or kneeling on the edge of the pool is beyond the ability of too many in the class.

2. The practice of lining the class up and making them take turns in attempting to learn to dive is destructive in that it focuses attention of the entire group on what should be a private experience. This increases the emotional reaction to a point where, for many, effective learning is simply impossible. As well, only one member of the group is getting practice. Since we learn by doing, the class should be arranged so that in as little as five minutes each person will get six or seven attempts. One can easily observe classes where in ten or more minutes a single person will spend most of the time shivering at the back of the line and make only one attempt at a dive. If the one attempt results in a belly-flop then it earns him a generous dose of embarrassment to go along with his shivering body and blue lips. Is it any wonder that so many fail to learn to dive with confidence?

The whole procedure of teaching diving should rest on the principle of a progression of tasks, each one within the ability of almost all of the class at the moment. Such a progression follows but must not be thought of as a rigid series of steps from which no deviation is allowed. These tasks begin in waist to chest-deep water.

Task: "See if you can touch the floor of the pool with your hand." This allows the learner to sit down, lie down, rotate forward to a handstand, or even to go over sideways to solve it. Ask pupils to keep the eyes open whenever under the water.

Task: "See if you can put both hands on the floor of the pool." Again, this allows a full range of responses, rotating forward, sitting down, and the like.

Task: Keep both hands on the floor until you want to take them off." This requires offsetting buoyancy and so pupils must do one or more of the following: deflate lungs, use upward action of legs, or get the legs at least partially out of the water in order to decrease buoyancy. Now is the time to start to restrict responses so that the pupils begin to "shape" a dive. To do so the next task must specifically require a forward rotation about the hips.

Task: "Now, put both hands on the floor again, but this time everyone do it by going forward so that you get your feet out of the water." Some may complain about water in the nose. Explain that slight positive pressure in the nostrils will keep it out. If no one complains, do not mention it. If some are having difficulty getting forward into a hand stand ask them to watch someone near them who can do it. Do not necessarily choose the best in the group as a model. The dive can be further shaped now by having pupils stretch the body as long as possible when the weight is on the hands. Ask pupils how they are keeping their balance in the handstand. Answers will include such things as: lifting and lowering the head, bending the arms at the elbows, walking one hand, and using back arch or movements of the feet and legs. The final objective of this phase is to be able to do a handstand, showing a long stretched body shape, and holding it until the pupil decides to come down. Such skill will take several 3 - 5 minute practice sessions to master. There is no need here for turns or for all to begin and end each attempt in unison. Each works at his own pace under the observation of the instructor. When he wants the pupils' attention he simply requests them to stop. If one or more are underwater, a neighbour touches them to get them up where they can follow the next instruction:

Task: "Now, start forward as though you are going to do a handstand but instead, see if you can slide your hands along the bottom and follow them so that you swim along underwater for a while." Should a pupil ask what swimming style to use underwater, tell him to use whatever style he likes. Be sure to emphasize keeping the eyes open so "you'll know where you're going."

Task: "Stand with your back to the side of the pool and see if you can use your feet on the wall to help get down near the bottom for an underwater swim." Emphasizing keeping the eyes open so the pupil will not hurt himself on the bottom of the pool. Now the pupil is ready to begin diving from the side. Perhaps a review of one or two handstands before trying an entry from the side would help. Before going to the deck ask the pupils which they would rather bump the floor of the pool with; their head or their hands. Point out that one can protect one's head by keeping the eyes open, and the arms outstretched with the hands in front until one is moving along the bottom.

Task: "Sit or kneel on the edge of the pool and try sliding into the water, just like you were, so that you go along underwater for a while."

The key to diving is the roatation forward. With the kind of lead-up outlined all pupils gain personal experience with this key. Pupils practice entries from a kneeling or sitting position, at their own pace. If they bomb, only the person himself and the instructor is aware of it. Emphasize a roll forward, eyes open, arms out to protect the head. As they get better at it ask them to stretch out as the body leaves the side of the pool. The instructor's role here is to note progress and require individuals who are getting skilled to move on to the next step. Move from sitting to kneeling on one knee, to a deep crouch, to a slight crouch and finally to a full stand. When standing it will help many at first to have a distinct bend at the waist. Emphasize that the dive begins with a fall (rotation) forward accompanied by a knee dip and as the foot or feet leave the side, the legs push and the body extends to the stretched position. The arms are over the ears. In early attempts from a crouch or stand it is best if one foot is forward and one back. A slight lift of the back foot as the fall begins is helpful.

Diving from the side can be done into two foot six inches of water for young children. A good rule of thumb is to try to have diving into chest deep water at first. Continual reminders about protecting the head with the hands are necessary. Some people develop the dangerous habit of using a breaststroke-type pull with arms as they enter the water in a dive. This not only exposes the head but pulls the diver towards the floor of the pool at an increased speed. Allow the pupils to do whatever they wish with the arms so long as at the entry they are outstretched to protect the head and to produce the correct diving body position.

If anyone stalls, have them go back to the last previous successful step and practice it some more. Keep an eye on them and encourage or assist where necessary. When ready, have them move forward again to the next step if they don't do so on their own. In this way a class of ten may soon be busily working on six or seven different steps at a given time. But note how diligently they work and how their own progress results in real satisfaction and enjoyment. There are no emotional crises or blue, shivering pupils, hoping the lesson will soon end.

The angle of entry is primarily controlled by two simple factors: 1) The duration of the fall that preceedes the push-off into the dive. 2) The degree of leg lift introducted as the feet leave the side.

The skillful dive from the side of the pool might be described as follows: the diver stands erect at the side of the pool with toes curled over the edge, arms at sides in a relaxed posture. He begins a straight fall, like a building toppling over, as the fall progresses he he swings his arms in a relaxed but fairly rapid action either forward or backward, this is accompanied by a dip or bend at the knees to allow a push-off from the edge. As the feet push off the edge they may be lifted to varying degrees. The greater the amount of leg lift the more rotation is promoted so that the entry is more nearly vertical.

As soon as pupils are working confidently in deep water they should use diving entries into the deep water and do most of their practice there.

To the point where the pupils begin diving from the deck of the pool the progression is not only leading to diving but is providing a number of other side benefits. It is developing breath control through providing a reason for staying underwater for long periods; it is giving experience in a variety of body positions underwater and in using vision and body movements to control body shape and position underwater; it is providing first-hand knowledge of the buoyant effect of water (Many pupils complain that they cannot get down to the bottom. Often these are people who were afraid of being on the bottom at all times!); it is a lead-up to surface diving. Surface diving can be taught very easily by asking the pupils (along about lesson six or seven) to swim along face down and then go into the hand-stand action without stopping to put the feet down. Then ask them to swim along with any face down stroke and go under as though they were going into a hand stand but instead slide the hands along the floor of the pool and do an underwater swim. They try it in deep water. After several short practice periods of this type the instructor will only have to polish up some rough spots to get very presentable surface dives.

The back dive can be easily taught using the same principles.

APPENDIX C

PROGRESSIONS FOR DEVELOPING THE STANDARD SWIMMING STROKES

PROGRESSIONS FOR DEVELOPING THE STANDARD SWIMMING STROKES

Murray Smith

University of Alberta, 1970

A previous paper entitled Teaching Beginning Swimming detailed an approach to helping learners develop skill in what was described as fundamental propulsion in the water. Introduction to deep water, and diving (both from the side and surface diving), were also outlined.

One of the main principles underlying the suggestions contained in that paper is worth re-emphasis here. It is well established by both research and the experience of sensitive teachers (to say nothing about frustrated learners!) that when people of any age face the difficulties of learning a new and complex skill, nothing is so helpful as a real degree of freedom in attacking the problem in their own way. This is not to say that everyone "does his own thing" all the time and the instructor is just another one of the class without any control over them. All teaching styles described by even the most "avant garde" educators of this day advocate controlling influences but these are more subtle controls that interfere less with the learning process than the rigid, militaristic type of environment more common in the past.

The working instructor will be more interested in ideas he can apply at once since he faces classes virtually every day. One expects that his interests in extremes in teaching style, if such interest exists at all, will be only academic. For that reason, what follows are ideas developed with real learners (not with classes made up of swimmers "pretending" to learn). They are ideas gleaned from putting the findings of research to the test at pool-side and combining the workable ones with personal experience and the rich store of knowledge from the past.

It will be useful to make two points which I believe have a real bearing on the development of skill in standard swimming strokes:

First, is the idea that at all times the learner should start out to swim as though he were going to swim a long distance. Much harm is done by enthusiastic learners starting out like a house afire and fighting like mad for five or six fast strokes. Here the tortoise approach, as usual, beats the rabbit's. Stress always: "take it easy, stroke at a comfortable easy pace, do not race or try to go too fast." Remember that a long distance for a beginner is four or five strokes but soon it becomes 15 or 20. Assess each person's ability and do not let anyone underestimate himself.

Second, remember that in real life improvement in complex skill comes slowly, a little at a time. We learn nothing perfectly at first. We learn to perform crudely and then refine it gradually as we practice. But we only improve if we have the right guidance. If we do not have proper guidance either from ourselves or others then practice does not make perfect, it makes us perfectly wrong! Since real skill develops slowly through proper practice we should not waste time with lengthy, complex, demonstrations and explanations. We build skill and understanding bit by bit as we go along. In this respect extended use of deck or water part practice is very wasteful. Sometimes it is very helpful and I have tried to indicate some of those places in this paper. But at present many pupils spend much less than half of the available time each class actually learning. They spend far too much time lining up, waiting for turns, doing deck drill, and the like.

Skill is "shaped" as the sculptor shapes clay, gradually form and detail appear, it is a whole process rather than a series of disjointed parts that are somehow stuck together, and it is the learner himself who is the sculptor. Our job, as instructors, is to assist in his development as a creative learner.

The Front Crawl

I believe that because of the extreme popularity of the crawl and the basic alternate action of the limbs in the stroke which is much like the way the linbs are used in walking, that this should be the first standard stroke to receive attention.

As soon as the learner is able to swim about 30 feet face down using an alternate arm action and a gentle flutter-type kick, while maintaining a reasonably stretched body shape with face in the water, he is ready to begin developing the front crawl. The reader will recognize how much of the front crawl stroke is already present and under some control by the learner.

The class should review the stroke as described in the paragraph immediately above. Pushing off from the side to swim 20 to 30 feet out, standing up and then returning, is all that is necessary. Ask the class to repeat the swim but this time during the recovery action of the arms "try to lift the arms up out of the water". Rather than giving more detail as to form or style at this time it will be much more valuable to stress keeping the body stretched and moving the arms at a moderate speed. "Do not hurry. Take it easy. Try it."

Those who are good at this from the beginning (they may well have learned this on their own or from friends) should be encouraged to start working on breathing at once. Learners who find the overwater recovery difficult might find it easier if told to stop kicking and just keep stretched out face down as they try to get the feel of the arm action. As the class practices, they stop only long enough to catch their breath. Every few minutes the instrcutor adds new information.

"Try to keep the hand close to the water and the elbow high like the peak of a roof." The next time he might add, "Reach the hand forward to enter the water well out in front of your head. Do not dive the hand back into the water close to your head. Reach in front." Reminders to, "feel the hand pushing water backwards as you stroke", will be useful.

Breathing should be introduced within 5 or 10 minutes of starting work on the crawl. As each learner begins to get the hang of using his arms in this new way, while keeping stretched, he attempts to begin adding breathing. Beware of giving so much information that the learner becomes confused. Try saying, "Before you want air too badly, see if you can blow out underwater, turn your head to either side, and try to get some new air through your mouth." Stress that the head should be turned not lifted so as not to lose buoyancy or destroy body position. Of course at first most learners will lift the head but with practice and the instructor's help they will gradually bring it under control.

Body stretched, face in the water, easy arm action, gentle kick, turn the head to breathe: these are the things to stress over and over. But stressing does not mean "bugging". Especially with poorer learners, the instructors should ignore mistakes on the first few trials of something new. Let them struggle with the problem themselves. All of us know now annoying it is to have a person in charge judging our every attempt to learn. If anything is said it should be encouraging. Very soon the learner will want help. This is because he overwhelms them with interference. By saying less, the instructor will soon find the learners much more receptive to his efforts to help.

Body position, a real key to efficient swimming, will be enhanced if the face is kept in the water, and the learner asked to reach the hand and arm well forward as the arm enters the water.

It is assumed that the instructor has a pretty clear mental picture of the complete crawl stroke in mind as he works with the class.

There is no intention of describing the strokes in detail in this paper.

Note that to this point there has been no need for a demonstration in the formal sense. A skilled demonstration of the crawl for beginners is about as useful as having beginning pilots watch a skilled aerobatic display. It might inspire some but it is at least as likely to discourage. As the class progresses have learners themselves demonstrate. Select one who is making progress and focus the attention of the class on the aspect you want them to watch. For example, it may be the whole stroke or how the breathing attempts are coming. From time to time, each learner should be called upon to do something he is good at. This is a powerful motivator. The time for a skilled demonstration of the complete crawl is when the class are able to perform a recognizable version of it for 30 or 40 feet. Even at this time it is not essential but would likely be useful.

All the practice is in the water in the swimming position. Breathing is added as soon as the individual can cope with it, not when the instructor thinks the whole class is ready. If some learners ask to bob and breathe, or stand bent over and practice breathing, they should be allowed to, but no one should be required to do this kind of part practice.

Using the prinicples of distance swimming described under phase eight of Teaching Beginning Swimming will be invaluable here. The instructor offers the class information and tips to individuals and each works on the crawl stroke to increase the distance he can go. Do not over-emphasize skill at this point. Look for increased distance and the ability to attempt one or two more breaths than previously. If some fast learners continue to progress let them practice on their own. The instructor's job here is to organize things to reduce traffic jams and give help as needed on stroke improvement.

For those having particular problems with breathing try the following. Ask the person(s) to go some reasonable distance, say a width, and take one breath. They try getting two breaths over the same distance. Then three breaths. He should be encouraged to swim, get a breath, then take several more strokes before stopping. If the learner is not careful he can develop the habit of stopping and standing up or treading water after each attempt to breathe. Struggling and sputtering to control water accidently taken in with air is necessary in mastering crawl breathing. If he is not made aware of this it may become too easy to quit at the first sign of trouble. There is no short cut to learning crawl breathing. Once the fundamentals are understood the best thing is to swim crawl and keep track of how far one can go. Forcing oneself to go an extra few yards to a new personal record of 25 yards one day and increasing that to 30 or 35 yards the next, 40 yards the next and so on.

Once the swimmer can go 100 to 150 yards with the crawl, non-stop, he is well on his way to mastering breathing.

The learner should develop his own breathing pattern. Requiring all of the class to breathe every stroke, or every second stroke, simply puts up an artificial block. Give them freedom to try various patterns. Once the learner can go 5 or 6 lengths using his own pattern he will be able to modify it in many ways if that appears useful. Good crawl swimmers exhale either rather slowly and continuously while the face is in the water or, hold the breath until just before rolling the face to the side to breathe, and exhale "explosively" at the last moment. Some even use a combination of these two ideas. They also complete the exhalation while the face is in the water. It goes without saying that inhalation must be begun and ended while the face is out of the water. Precision in beginning and ending the two phases of breathing is necessary but takes considerable practice.

Because of the special problems in learning to breathe in the crawl it will be useful to list the sources of difficulty. In attempting to help slow learners the instructor might find valuable assistance among these points:-

1. All of us learn to breathe primarily through the nostrils and in atmospheric pressure. In the water we must learn to shift to exchanging air primarily through the mouth, and exhaling is against the considerable pressure of the water.

2. While blowing out used air may take considerable time, taking air in must be done rather quickly so as not to disturb the rythym of the stroke. Exhale over a longer period of time, inhale quickly. This change in the timing is difficult for some individuals to learn.

3. Over a period of time, the volumes of air inhaled and exhaled must be about equal. If either one is greater than the other, trouble soon develops. The instructor cannot "teach" the student to equalize these volumes but if he points it out the student may soon "learn" how to correct it himself.

4. The average volume of air inhaled must be equal to the demands of the body. This demand is not constant but increases as the vigor of the stroke increases and as fatigue sets in. It is little wonder that learning to breathe in the crawl is a real problem for many people. There are so many facets to this complex skill.

   But by adopting this general approach and modifying it as desired more learners will experience success. Difficulties are only emphasized and learning delayed by extensive amounts of bobbing and breathing and other kinds of part practice, and by failure to emphasize the distance aspect during early practice.

The instructor will do well to constantly review good sequence diagrams of crawl strokes, films (especially underwater) if possible, and observe good crawl swimmers in action. In this way he will improve and consolidate his own understanding of what efficient crawl strokes look like. They he will be better able to assist learners when they need it.

The Elementary Backstroke

The most common style of "fundamental swimming" on the back displayed by learners given a free choice of style as beginners is an easy flutter kick combined with a simultaneous arm action (a simple finning action). The instructor should not be upset by the fact that this is a "mixed up" stroke. It can be compared to the crude speech patterns of young children. We know that they are soon replaced with more mature ways of talking.

Before outlining a procedure for the elementary backstroke it is fair to ask why it is suggested as the second conventional swimming stroke for beginners. Without getting into too much detail one may offer the following reasons: 1) a backstroke is offered second since it will provide the learner with a stroke in his second major body position and utilize the principle that "a change is as good as a rest." 2) There are only two clear-cut "families" of strokes; the crawl (alternate limb actions) and the breaststroke (simultaneous limb actions). The elementary backstroke then provides the most tolerable introduction to the breaststroke family. Most experienced instructors agree that this is the easiest stroke in the family to learn. 3) While the flutter kick is essentially "natural" (the legs are used alternately as in walking), the breaststroke kick is not at all natural and requires more attention to learn than the former kick. The symmetrical action is not easy to attain and may well be made more difficult if the scissors kick of the sidestroke is emphasized first. With breathing problems minimized, the swimmer on his back is more capable of concentrating on incorporating the symmetrical leg action and coordinating it with his arms.

One more point deserves mention here. Much confusion exists regarding terminology of kicks for this stroke.

Labels, names, often increase confusion since people assign them different meanings. For beginners of any age much is to be gained by emphasizing the two obvious common elements of the kick used in the breaststroke family: simultaneous and symmetrical action of the legs. If veteran instructors argue into the night about what is meant by frog, whip, squeeze, rotary or other labels applied to forms of this leg action, where does it leave the learner? Usually in utter confusion. Most instructors are fully aware of the theoretical advantages of a narrow kick that involves essentially the lower legs. (Is this a whip kick?) Undue emphasis on this to beginners produces much interference with learning.

Best results are obtained by throwing out the labels and stressing the idea that as far as possible, one leg mirrors the other. For some this will mean a very wide kick, others will almost at once use a narrow action. There is little to be gained by forcing changes as long as the legs are reasonably symmetrical. Later some may well modify the kick to look like the narrow version popular today. In some cases, stiffness (lack of flexibility) in the hip, knee, ankle and foot may make a narrow kick with rotary action in the lower leg an impossibility.

Now, to the question of developing the elementary backstroke. As soon as the learner can travel at least 30 feet on his back by his own preferred method, he is ready to start work on this stroke. The important task is to change the gentle flutter kick to a breaststroke kick. (See, no label!) The simultaneous arm action is already under some control.

Have the class do a short review swim on their backs using the flutter kick and simultaneous underwater arm action. Then demonstrate 4 or 5 cycles of the leg action while lying on your back, legs out over the water. Do not emphasize detail. Do emphasize that to begin with the legs are straight and together. The feet remain close together as they drop down towards the bottom, (the knees do not lift up), then the feet circle away from each other. "Legs straight, drop the feet, circle the feet away from each other." (Complete the demonstration in 30-45 seconds.)

Ask the class to try it with the following options: on the back with no support, or supported by a partner, or holding a buoyant aid on the stomach. Let each choose how he would like to practice. If some wish to use the arms at the same time, let them. Point out they should try to make the arms and legs work together, bending, spreading apart or circling, then stroking at the same time.

During early practice stress a pause after each cycle of the legs. "Wait a moment before starting the next kick." Once the kick is donw in some reasonable form require those not using their arms to begin attempting to do so. Those with uneven leg actions should be encouraged to use a buoyant aid to help concentrate on correcting the fault.

Focus the learners' attention on proper use of the feet, after a reasonably even kick is present.

Three common faults should be pointed out when they occur: 1) leave the head in a flat position with ears underwater, chin slightly tucked in, especially during recovery of the limbs. 2) Try to keep the knees on or under the surface, not lifted above it. 3) The hands, during stroking are often pressed down and then swept up towards the surface which creates excessive vertical motion. Instead they should sweep parallel to the surface at a fairly constant depth of 6 inches to one foot.

If the pause between strokes is not long enough ask the class to count the number of strokes required to do a width or a given distance. Then ask each one to try to do the same distance in fewer strokes.

As the class works on increasing their ability to cover distances with the new stroke, the instructor periodically stops them for a general tip and offers suggestions to individuals as he notes the need.

The Breaststroke

Once a fairly accurate elementary backstroke is in hand the learner can move on to the second member of this family, the breaststroke itself.

It should not be unusual to see some class members already working on the breaststroke after as little as ten or fifteen minutes of work on the elementary backstroke has taken place.

When the instructor observes a pupil(s) doing the backstroke version well and there has been a reasonable chance to practice the new stroke he might proceed in this way: "Turn over face down and try that same kicking action. Try to keep your feet underwater. Get support by holding a buoyant aid if you like." As soon as the learner wants to (some will want to from the beginning) let him try the arm action with the legs. Here it is important to offer just enough information (through words and a demonstration) to inform without confusing. A brief explanation -- demonstration by the instructor is useful. Stand with arms over-head and illustrate an arm cycle with both arms, followed by a kicking action with one leg. Describe it something like this, "start stretched out, face down, first move the arms like this, then the legs. Do not move arms and legs at the same time. First the arms, then the legs. Try it." Again this represents a 20-30 second demonstration.

Almost without exception learners will make faster progress if required to keep the face in the water to enhance both buoyancy and body position. Once the learner is able to perform 4 or 5 consecutive strokes ask him to try to breathe by lifting the head as the arms begin to pull. Exhaling may be done either with the face in the water or after lifting the head since there is much more time to breathe in this stroke.

Insist on a distinct pause after each stroke and kick cycle. "Arms, legs, pause. Repeat." One common problem is that the arms cycle continuously with no pause after each stroke. The instructor must focus the learner's attention on keeping the arms stretched and straight until the kick is finished. When the learner gets good enough to travel a width or so in fairly good form he can try to begin the recovery action of the legs just as the arms finish stroking. This rather minor change will establish the accepted coordination of the stroke.

Students who learn quickly will soon master this stroke in this manner. As their slower classmates work on developing their skill the faster ones can be encouraged to try the inverted version of the breaststroke. In this version there are only two aspects to emphasize: 1) There is only one pause in the stroke, it is in the long stretched position, arms forward. 2) The arms stroke through a full 180° each. That is they begin from the stretched position and sweep sideways, arms either straight or only slightly bent, to stop at the sides of the legs. The recovery begins at once. In order to keep the hands and wrists under water throughout the recovery, the elbows must drop down towards the bottom of the pool. The kick is delivered as the arms recover.

The double overarm version of the inverted breaststroke is done simply by making a straight-arm recovery out of the water. The arms return, straight and together, moving in a plane perpendicular to the water surface. These last two members of the breaststroke family need not be learned by everyone but fast learners can easily learn them as slower classmates work on the regular breaststroke.

The last regular member of this family of strokes, the butterfly, will be outlined in a separate paper.

The Back Crawl

From the backstroke usually seen in fundamental swimming (simultaneous arm action and flutter kick) it is but a short step to the back crawl. Review the beginner backstroke and check to see the body positions are stretched, head in the "reading" position (ears underwater, chin slightly tucked in), flutter kick controlled and light rather than too heavy and trashing.

Ask pupils to try swimming on the back using first one hand and then the other to push water back. As they do this the hands and arms should be continually under water. After several attempts at this ask them to return the arm over the water. Let them practice without giving much more detail than to say that the arm should be lifted out and carried back straight, without any bend at the elbow. As long as they do not try to stroke too rapidly some will do an excellent back crawl at once. Stress a rather slow deliberate stroke where the arm is placed in the water rather than slashed into it.

After several attempts point out that each arm works in two different planes. As the arm recovers it travels straight over the top in a plane at 90° to the surface of the water. As it strokes it travels in a sweeping action in a plane parallel to the surface of the water.

The hand moves through the water at an average depth of a foot or so. The arm thus "recovers over the top" and "strokes out to the side". Show the class this while lying along the edge of the pool with one arm over the water so they see clearly the two different planes you are talking about.

It may help the learner if he rolls slightly onto the arm that is entering. This not only allows an entry straight ahead of the shoulder of the entering arm (which is best because it is most streamlined) but it helps free the opposite arm to recover cleanly over the water. Although the body rolls easily on the long axis the head does not and is held relaxed and not allowed to roll with the body. Many swimmers, however, swim this stroke with little or no body roll. This is fine but not more desirable than showing a roll. The point is a roll is quite alright as long as the head is held fixed.

Most recreational swimmers find this stroke easiest and most comfortable with a straight arm action in the water. Even though a bent arm pull is known to be more effective it should not be insisted on in this stroke. The best competitive backstrokers and a few casual swimmers use the bent arm action underwater but it seems to be comfortable only for those who have trained a good deal and developed a lot of strength in the muscles involved.

The Sidestroke

It seems best to delay work on the sidestroke until a reasonable elementary back and breaststroke are within the ability of the learner.

Begin this stroke by asking the class to review the fundamental face down stroke using an alternate arm action, with arms always underwater and a gentle flutter kick. Ask them to attempt this stroke while lying on either side. Encourage them to try both sides if their first choice of side feels unnatural.

Practice swimming this beginning sidestroke should emphasize keeping the body straight but distinctly on its side with the head in a natural position rather than awkwardly cocked back as is often the case. It is not necessary to maintain the face free of water at all times. When attempting to breathe, the mouth can always be momentarily cleared by a slight motion of the head.

At the beginning stage the kick will be a flutter. Before working on the scissors improve the arm action by getting a full reach forward from the underarm and a full push back, keeping the hand quite close to the body, from the upper arm. Once a full range of motion is present ask the pupil to pause and wait a moment when the hand of the underarm is fully forward and the hand of the upperarm is as far back as it will go. In this position the upper arm will be stretched at the side with the palm against the outside of the thigh. Tell him to pause when his hands are as far away from each other as he can get them.

Introduce the scissors kick with a brief demonstration of 4 or 5 cycles by the instructor on the deck. Have the pupils attempt the kick supported on their side by a buddy standing behind them or while using a buoyant aid. If some wish to try it with the arms while swimming let them do so. For those who have real problems with the kick, have them try a rail drill in the usual way but do not require the whole group to this kind of drill.

APPENDIX D

TEACHING METHODS FOR SWIMMING INSTRUCTORS

TEACHING METHODS FOR SWIMMING INSTRUCTORS

Murray Smith

University of Alberta, Edmonton, January, 1970

One of the most difficult tasks any of us face is overcoming our past. This has always been the case. For example, Henry Ford decided that the Model-T was the ideal car and all that was necessary was to keep producing it with small refinements. He was also fond of saying that you could have it in any color . . . as long as it was black. Such a solidification of attitudes is common among all of us, but it is not usually so easily recognized. The only thing that changed Ford's ideas was the presence of competitors whose minds allowed the possibility that a better car than the Model-T could be built, and that it should be possible to paint cars any color one wanted.

Perhaps unfortunately, economic pressure or threats to actual physical survival are often the only things that will make some of us even consider examining alternatives to the ideas they accept and upon which their actions are based.

T. K. Cureton, one of the great pioneer physical educators, who has greatly influenced his field for over thirty years, described the main ideas involved in swimming instruction in his book How To Teach Swimming and Diving. This book was originally published by the American Y.M.C.A. in 1934. A survey of chapter seven, where cureton has summarized various systems of teaching beginners, will convince the reader that very little in the way of new ideas has been incorporated into teaching swimming in the past 35 years or more. This would be acceptable if all of the best techniques had been applied in the first place. However, research has identified many important factors in learning since Cureton's excellent book was written. Indeed, as is always the case, there were many principles of learning fairly well established even in the mid-thirties that had not yet begun to influence teaching methods in swimming or in teaching anything else. This is always the case and is understandable. But in swimming we are still building Model-T's. Chrysler and General Motors have not yet forced us to examine other possibilities. Of course, the Model-T was a good car, it worked well. In the same way, existing methods in teaching swimming work. But, to assume that they cannot be improved is foolish. When Cureton wrote his book, basements for new houses were dug by horses pulling a metal scraper. They did the job. But who in the construction industry would abandon the bulldozer to return to the horse-drawn scraper? Horse breeders resisted the change for obvious reasons. In some ways an unwillingness on the part of instructors to give serious consideration to new ideas is as selfish as the horse breeders' attitude. We should realize that as instructors we have an obligation to our pupils that is greater than closing our eyes to improvements that are easily available to us.

The present writer does not advocate a wholesale discarding of present methods. What is needed is an attitude change among instructors what will enable them to honestly evaluate what they are doing at present. When present practice cannot be defended adequately then abandon it and replace it with techniques that can be defended. Many of the things we currently do are quite satisfactory, let us keep them. In order to be sure we are keeping the right things though, we must examine everything carefully.

How Do People Learn Complex Skills?

In swimming, the recognized strokes can accurately be described as complex skills. We usually teach them by having pupils practice one part at a time. Often the first practice is on the deck, then standing or supported in the water, and finally while supported only by the water. Then we go at another part of the stroke in much the same way. This is called part-whole teaching. We begin with parts, as nearly correctly executed as possible, and add them up to the whole stroke or skill. This seems logical. However, it we observe people really learning we will almost never see them approach a problem in this way. They usually do what is described as whole-part learning. That is they attempt as best they can to do the whole thing they want to do. If they cannot do it they will break it down into something simplier, something less than the whole which can be called a sub-whole. They will simplify the task by leaving out some of the features of the whole until they arrive at a sub-whole that is within their ability to perform. But it is important to note that this sub-whole is not very often the kind of part that we usually see being worked on in swimming classes. For example, as soon as a pupil is able to do a face down float and swim forward 20 to 30 feet using his hands one at a time (dog-paddle fashion) he is ready to advance to a clearly recognizable sub-whole of the crawl. If he merely lifts his arms out of the water to recover them after each stroke and combines this with a gentle walking action of his legs he will be doing something very close to the crawl. He will not likely be breathing and the actions of his limbs will not be the skilled actions he will be able to do later. But this incomplete, and in some wasy inaccurate performance is a sub-whole of the crawl that, with practice and help from the instructor, will soon be a much more complete whole. It is not hard to see that this is quite different from practicing parts of the stroke on the deck or while supported stationary in the water and then attempting to add these together to form the whole stroke.

One can easily identify part-whole teaching by the face that we see pupils practicing actual parts (leg action or arm actions, or breathing technique) in isolation, by themselves. Further, much of this practice is on the deck or while stationary in the water as mentioned above.

On the other hand, whole teaching is identified by the face that very seldom do we see parts practiced in isolation, by themselves, rather we see the whole stroke or a sub-whole being practiced, and practice is in the water in the horizontal position. We will see some practice of parts in isolation, but very little. Often, in the early stages, beginners will use a board or some other buoyant aid to help support them in a true, horizontal position in the water. I am convinced that the proper use of practice of isolated parts in swimming is in remedying individual or even group difficulties that become obvious after whole practice.

The compromise of breaking the whole down into a simpler, more manageable unit, called a sub-whole, leads one to describe this approach to learning with a different term. Since the final, whole, stroke, that is the objective is not practiced, it is no longer truly whole-part learning. A term that has been used to describe this modification of whole learning is progressive-part learning. That is an incomplete sub-whole is practiced and then parts are progressively added until the whole stroke is achieved. Thus the progressive-part method might be thought of as a bridge between a part-whole method and a whole-part method.

Bryant Cratty (1964) one of the foremost modern authorities on the learning of motor skills writes:

> Quickest learning is generally obtained by practicing the "whole". If subsequent evaluation of performance suggests that the portions of the task selected, or a task as an entirety proved too large and/or complex for acquisition, the progressive-part method would then seem to hold the most promist (p. 241).

With respect to the merits of part-whole methods, here is what world swimming authority James Counsilman (1968) of the University of Indiana, has to say:

> ...In many instances, however, the traditional part-whole method of teaching, as used by many teachers and advocated by many groups, is vastly inferior and even detrimental to the learning process (p. 171).

The very best he can say for traditional part-whole teaching is "vastly inferior" and "even detrimental to the learning process"! Research evidence favoring progressive-part learning is provided by an interesting study that involved boys and girls between 7 years and 6 months of age and 9 years and 6 months conducted by Lewellan (1951). He compared distance and form on the human stroke after 21 lessons of the 30-minutes each in which the control group received part-whole (American Red Cross) instruction and the experimental group the same amount of instruction but by a progressive-part method. The part group averaged a distance swim of 28.82 feet and received an average form rating of 6.50 out of 12 points. The experimental, progressive-part group averaged 47.95 feet in distance and 7.79 in form. Form was judged by an impartial panel of twelve expert instructors. Evidence in support of whole-part learning can be clearly seen in another experiment conducted by Roy Niemeyer (1958). He compared a group of male university students taught by a whole-part method with a matched group taught by a part-whole method (in this case the American Red Cross method). In discussing the results of this study Niemeyer states:

> The swimming results showed that the students in the whole method group learned to swim sooner, farther, and faster than those in the part method group, moreover, they showed better form. A greater percentage of whole method subjects also learned to swim at least one hundred yards. Perhaps the most remarkable difference was in the distance swim. The mean distance for the whole group was 845 yards, while the part group mean was 442 yards. Undoubtedly, better form in the four basic strokes and having learned to swim earlier in the experimental period favorably affected the whole group's distance swimming ability.
>
> Form (including the perfection of parts) was emphasized in the part method, but the part method group was found to be inferior in form when compared with the whole method group (p. 123).

The last paragraph is particularly interesting when one notes that traditional part-whole instructors often base the justification of their method on the premise that pupils will learn to swim "correctly" through perfecting each part in isolation.

An important point to re-emphasize here is that both the wholes and sub-wholes referred to above are attempts at swimming in the water, they are not land or rail drills or part practice while standing in the water. While such practice of wholes or sub-wholes is going on, a specific part of the stroke such as the arm action or the kick, might be seen to be causing trouble, then the learner will be best to focus his attention on this part and may indeed engage in part practice. Such part practice may even be a rail or deck drill. The difference here is that all the pupils are not required to practice all the parts before attempting a certain stroke.

A small amount of the kind of part practice often done extensively by traditional instructors is of value. But very much of it is extremely wasteful of both time and effort. Part of the explanation appears to be in the fact that the "whole is greater than the sum of the parts" and when parts are learned separately as in traditional teaching in swimming, a good deal of time must then be spent "putting the parts together". This idea has been advanced by the Gestalt psychologists . One of this group of psychologists, Gates (1948), sums up the matter in this way:

> Learning to do the parts singly is by no means learning to do the whole. The greatest difficulties are often encountered in putting the elements together. Moreover the elements are often already sufficiently developed without the preliminary practice; if not, they are usually more economically perfected in practicing the whole.
>
> Those which do not develop sufficiently while practicing the whole may well be handled singly later, but not until it becomes necessary. We should not begin with elaborate formal exercise of the elements or make them a large part of the course of training but should utilize them as strictly preventive measures where a particular defect or dificiency is apparent. When thus singled out for specific treatment, a particular aspect of a total performance has a significance and character it could not have as an isolated segment practices without respect to its membership relations. In the case of very complex tasks, it may be necessary to break the total performance into functional units, practicing each of these sections as a whole. Special attention then has to be given to the integration of the "sub-wholes" into a working pattern (p. 347).

Gates was not writing about swimming in particular but about the learning of complex things in general. When read in the context of swimming however, it appears to have been written directly in relation to this topic!

To return to the question asked at the beginning of this section: "How do people learn complex skills?" We can sum up by saying that this is done by attempting the whole skill if there is reason to believe the learner can cope with it. If he can cope with a crude performance then he will practice it while successively focussing attention on various parts that need correction or improvement. Through a series of refinements the learner will mold or shape a skilled performance little by little much as a sculptor shapes clay. However, if the whole turns out to be too difficult to cope with, the learner will leave out one or more parts until he gets down to a sub-whole, or incomplete whole, that he can cope with. In swimming this means he will practice and improve this sub-whole, working in the water in a horizontal position and when it is good enough he will go on to add parts progressively until he arrives at the whole stroke.

Very likely it is because real learning takes place this way that experiments have proven it to be the most successful approach.

Implies in this description of the whole-part and progressive part learning is a much larger amount of freedom for the individual while learning. It means breaking the old patterns that require all the pupils to do the same thing at the same time. Just how this can be done and how one can teach using more of a whole method will be discussed later.

Transfer of Training

Another wasteful feature of traditional part-whole teaching is that when we want pupils to learn, let us say, breathing in the front crawl, we have them bob and breathe while standing in the water. The intention of the instructor is that the pupil, once he can bob and breathe, will be able to breathe while swimming the crawl. But this does not happen. What they learn to do is to bob and breathe. This is not learning to breathe while swimming. Instructors know that many pupils can bob and breathe as long as they wish but cannot get more than one breathe while swimming. This is precisely the reason that the instructor is so often asked the wuestion: "How can I learn to breathe in the crawl?" The reason breathing is so hard to learn is that we prevent the pupil from practicing what he wants to learn.

The psychologist would say that we expect breathing as it is done while bobbing up and down to transfer to breathing while swimming. Transfer of training is also what we expect will happen as a result of doing flutter kicking drills while sitting on the deck or holding onto the gutter. We expect this stationary practice of part of the stroke, kicking, to transfer to the primary job at hand which is kicking while swimming the crawl. Transfer in this sense may be defined as practicing one thing, with the hope that it will improve something else. There are amny research studies that suggest that this is a very poor approach to teaching. What the pupils really learn is the land and rail drills, and the bobbing and breathing that they spend so much time practicing. Very little transfer takes place and that is what explains why the development of swimming skill is so slow when a lot of land drill, and stationary water drill of isolated parts of strokes is done. As has been stated earlier, some practice of parts is necessary and desirable but it is likely that many instructors spend from two to ten times as much of the lesson on this sort of thing than is efficient.

Two American physical educators have pointed out a further weakness of the use of the kind of drills that depend on transfer of training. Pape and Means (1963) point out that:

> Many of the difficulties in teaching complex skills stem from the fact that activities are often taught in an artificial environment, rather than in the setting in which it eventually will be used (p. 236).

Many coaches of team sports are aware of this danger and try to use what they call "situation" or :environmental" drills. These are drills that accurately simulate the situation, or environment, of actual game conditions.

In our instruction we can utilize the actual environment of swimming by seeing to it that our pupils practice as much of the time as possible while stretched body position should be used when necessary. This is not to advocate such aids for all pupils but, where it will help the learner, he should be allowed to use such aids. During beginning instruction pupils should have the option of using aids when they want them. This means that during the first few lessons we will see several members of a class frequently turn to aids while others use them seldom and some pupils do not use them at all. The pupils decide. The instructor does not decide for them unless he is more interested in showing them who is the boss than he is in helping them to learn.

Use of Demonstration

The adage that "one picture is worth a thousand words" may be true but it is a very dangerous one for the instructor. What does a picture of a nuclear reactor mean to a small child? Does a diagram of a carburetor mean much of value to a man who is not already a mechanic? The traditional use of demonstrations has resulted in losses of large amounts of time that should have been used for learning, it has often confused, and even discouraged the pupils. In brief, demonstrations often are too numerous, too long, too complex, and frequently leave the learner feeling he will never be able to do nearly as well or just that he does not know where to start.

A very useful set of simple tests might well be used to plan effective demonstrations. When teaching strokes or water skills arrange demonstrations so that:

1. They are usually no longer than 20 seconds to two or three minutes at the most.

2. Pupils do not have to leave the water to see them. In some cases they may have to leave the water but in most cases this will not be necessary.

3. The things the class were working on prompted the demonstration and make it appropriate at this moment.

4. The pupils watching it are most likely to think, "I can do that", or at least "I wonder if I can do that?"

5. Whenever possible, a member of the class demonstrates, not the instructor.

Pupils should demonstrate most times because it is easier for the rest of the class to feel that they will be successful since "one of them" is doing the thing. This also assures that most of the group are ready for the item. There is little use in demonstrating things that they are not ready to attempt now. The instructor should not hesitate to demonstrate if he can satisfy himself that it will result in greater benefit to the class. In practice, it is likely that the most effective instructors demonstrate fewer than one in every four times.

When one begins to use whole-part and progressive-part methods he will see how the kind of demonstration described here can be developed.

Let us discuss two simple examples:

1. A beginner class can do a reasonable human stroke (dog paddle). The instructor asks the class to try it again, this time return the hand and arm over the water, not under it. This is progressive-part teaching. The added feature is simple enough as to not need a demonstration at all. Watching the pupils, the instructor sees a good example of the arm action that the pupil may well have learned somewhere else. When the class have had a couple of tries and need a rest the instructor says: "John, show us how you are using your arms. Notice how he has his elbow up high but his hand is near the water. When his hand enters the water his arm is stretched out in front of his head." The class try to do this after having been stopped for only 30 - 45 seconds. They all feel it is possible and most, if not all, would like to be able to do it.

2. When the class has had a bit more practice they will start to add breathing. Again, no preliminary demonstration is necessary! The instructor says: "Before you get too desperate for air, try to get a breath. Blow air out of your mouth when your face is still under and try to turn your head to the side, without lifting it, to breath in through your mouth. If one doesn't feel good, try the other."

We learn by doing. Certainly there will be problems but recall the case mentioned previously of pupils able to bob and breathe indefinitely and still not able to swim a width of crawl. After a few attempts some may well want to bob and breathe or stand bent over with face in the water to try to gain control. Let them, but do not let them stay at it too long. After several attempts, again have a person who is beginning to get it (not always the best performer) show the class. The instructor might say: "Watch Nancy. She is now able to attempt breathing three times before she has to stop. See how she keeps her left ear in the water as she turns her face to the right to breathe."

After the class are getting fairly good at breathing we can have several members show the rest their strokes. Good features can be pointed out, and parts needing improvement noted. The class will be ready for this because they have built the stroke up and understand in their own way what is going on.

A standard demonstration of the crawl, with detailed explanation of the parts and how they are co-ordinated, presented to the class any earlier will simply delay real learning and even produce problems that could have been avoided.

Feedback or Knowledge of Results

Psychologists tell us that there is no more powerful influence in learning than knowledge of how one is doing. Feedback is information being received by the pupil, both from within himself, and from outside sources, from classmates or his instructor, as to his progress. When learning to breathe in the crawl, for example, feedback can come in at least three important forms.

1. The learner sees that he can get four breaths before stopping where before it was only two.

2. He can swim 35 feet before stopping, or has to stop only twice in a length. He can thus say to himself: "I can swim farther, I'm getting better. I'll keep at it."

3. He gets indications that his technique is better. The instructor says: "Last day you swam a length of crawl as you did just now. But today your head is turning, not lifting. It is looking much better."

In a few words feedback, which can be built into all learning if the instructor wants to work at it, can be summed up by the expression "Nothing succeeds like success." Under much traditional teaching pupils gain far more information as to how they are failing, because they experience very little success. Nothing fails like failure.

We have been talking about positive feedback related to success. Negative feedback is also useful. If the learner is making errors then information as to precisely what the error is will be the first step towards improvement. Too often negative feedback resulting from errors or failure is tinged with value judgements that make the learner feel stupid or inadequate. Good instructors can point out errors and offer suggestions in a way that does not attack the learner's sense of dignity. For example, judge for yourself the effects of these two approaches to a learner with an uneven breaststroke kick. First instructor: "No, No, no! Are you stupid? Weren't you listening? You'll never pass that way!" The instructor is providing negative feedback that will embarrass, discourage and possibly raise anger and resentment in the learner. But the second instructor takes a different tack: "The kick is smoother now but very uneven. Your right foot is much deeper than the left after your legs have recovered. See if you can keep the heels touching throughout the recovery. That way you may be able to keep the feet even."

A very important point here is that the instructor is in danger of providing too much feedback, of the wrong kind, at the wrong time. When any of us is first attempting something new we appreciate it if we are allowed to make mistakes (they are inevitable!) without being criticized for them. Letting early practice attempts go without constant correction is helpful. Just think of the last time you tried something new while a friend gave a constant stream of well-intended but annoying criticism. Remember that encouragement should predominate. Do not reward poor performance but be ready to reward the effort if it deserves it. Emphasize the positive. Success soon becomes its own reward for the learner.

Physical Principles

When one enters the water to swim one experiences movement governed by a whole new set of principles. Gravity is counter-acted (not necessarily completely counter-acted) by buoyancy. The center of gravity interacts with a new center, the center of buoyancy, to produce balance problems.

The density of the water, being about 800 times as great as the density of air produces great resistance to movement in any direction and at the same time usually results in massive losses of body heat. If learners are to progress satisfactorily they need a systematic exposure to how these principles apply.

Bryant Cratty (1964) has presented scientific evidence of the value of including appropriate ideas about physical principles in teaching motor skills. Dorothy Mohr and Mildred Barrett (1962) conducted a significant experiment in swimming which supports the claims that knowledge of physical principles improves learning efficiency. If one were to take up sky diving, one would expect to receive information on how the body is controlled during a free fall. In the same way experience and information about how to control movement in the water is necessary.

The important thing is that the learner needs to experience things for himself. For example: If the learner is asked to squat or crouch in chest-deep water until his chin is on the surface, and then stand on the ball of one foot, he will feel for himself how much of his weight is supported by the buoyancy of the water.

After the beginner can do a face-down float with arms extended he can experience propulsion if his attention is directed to the idea that forward motion in the water will only occur if water is pushed, or moved in some way, towards the rear of the body. Blowing up a balloon, holding it for a moment or two, then releasing it, will illustrate the principle that as the air escapes to the rear, the balloon is pushed forward, in the opposite direction. Reference to the action of a paddle in moving a canoe forward also illustrates the principle of propulsion (Newton's Third Law). The important physical principles are summarized elsewhere and should be referred to at the appropriate time during instruction. These principles should not normally be given in a complete package, at one time, because there is too much to absorb. Rather they should be drawn on at the "teachable moment" during class instruction. A demonstration of a summary of all the principles might well be appropriate during an instructors' course, or when instructing teenagers or adults, or for a swim team early in the season, but not for regular swimming classes for children up to about 12 or 13 years of age.

The most important thing here is that language and illustrations be meaningful to the specific class. It is no good to talk of Archimedes' Princiole (or even of buoyancy) or of Newton's Third Law to classes of any age. What is of real value is to give the class things to do that will result in their seeing how these things apply during swimming.

Instructors often remark that it is very difficult to effect stroke improvement of their pupils. Many of the frustrations met while trying to help pupils improve strokes result from either an inadequate understanding of the physical principles or a failure to realize that it is principles that provide the key to stroke improvement. The instructor helping pupils "polish up" strokes should be constantly referring to the principles summarized on the chart elsewhere. Once he practices careful observation of swimmers so that he can interpret errors in terms of principles, stroke improvement becomes much more efficient.

Emotional Aspects of Learning

Among the most difficult problems for the instructor is how to handle the emotionally tense, or "afraid" pupils. The tense or afraid learner often experiences real problems at one or more of the following critical tasks: entering water of any depth; having entered, "putting his face in"; removing support so that he floats freely; entering deep water. There are no simple solutions to such problems. The sorts of things the instructor does should be guided by the question: "When I am afraid myself . . . really afraid . . . what kind of treatment helps me to get over it?" Among the things that will help are:

1. Patient, kind, behavior by the instructor. Remember we communicate with looks, tone of voice, whether we face or turn our backs on people, and in many other ways. In all of them we must communicate support and understanding. Being decent for the first two or three times is not enough! How many dropouts are created because slow or fearful learners refuse to face the embarrassment, ridicule, or neglect they receive once they start to experience difficulties?

2. Be careful what you say to them in front of others. Does it really help to say to a nine-year-old: "Why can't you do it? Your six-year-old brother can."

3. Encourage them to use buoyant aids if they are not willing to trust the water. Face down or back floats might be possible using an empty plastic bottle, a rubber ball or flutter board. Give them a chance to grapple with their emotions without outside influence of a negative kind. There should be no suggestion from anyone that it is "chicken" to be afraid, or to use aids.

4. Do not get "hung up" on something. Remember we have all beaten our heads against new things and wondered why we were so dumb. Often if you leave it and come back to it later you get it very quickly. So after a few honest attempts, let the person go on to something else for the time being. Later, encourage the pupil to return to the problem.

5. Encourage practice at home in a basin or bathtub as instructors have advised for years. Perhaps one of the best things is to plan for helping problem cases by arranging special times when the instructor can work with a small number of these people. Besides his direct help he will be showing these people that he really cares about them. Too often the instructor makes it clear that the only really worthwhile ones are those who are best in the class. It has been well established that too much fear, too high a level of anxiety, has a most destructive effect on learning. If the instructor is not careful he can create emotional problems in any phase of instruction, not just the problems mentioned above in relation to beginners. Thus a person who is very confident in the water may be fearful of other things to an extent that seriously interferes with learning. Typical causes of such fear are:

1. A moninant, insensitive, instructor. Many people who actually dislike children nevertheless instruct them. All of us respond best to humane, considerate treatment. Even the boorish instructor expects courtesy from a department store clerk, he should learn that his own pupils expect and deserve it too.

2. Asking learners to do things they are not ready for and which they would have more sense than to try on their own. Perhaps the only suitable treatment for the instructor who forces people to go off the high board before they are ready would be to find something of which he is equally afraid the force him to do it.

3. Too much emphasis on competition in the early stages of learning. The only way many of us can see clearly what the effects of various things on learners are is to put ourselves in the shoes of the learner. For example, if one were in a dressmaking class and were cutting out a pattern for the first time, imagine the anxiety that would result from trying to finish first! The worry about making a costly mistake pulling against a strong desire to avoid defeat would make the task very difficult. The instructor should consistently try to avoid the element of competition except when it clearly adds fun and enjoyment for the whole class. Later on, those who crave competition can get all they want in either friendly rivalry or in a competitive club.

The instructor will find that he can call on the emotional resources of his pupils by being human to all of them and arranging things so that all of them very frequently experience success. If there is a key to motivation, it lies in this direction.

Grouping Students for Practice and Drills

It has been common to conduct all, or nearly all, of each swimming class so that the class practiced in carefully arranged waves, taking turns, with groups going together. It will be relatively easy to see that if the things mentioned in the previous parts of this paper are to be attempted by the instructor he will use a much wider variety of grouping in conducting classes. Order in the class is important, but the appearance of order, that which looks like it is orderly, must not be allowed to seriously interfere with learning. Classes should be reduced to a size that will allow reasonable space for each pupil. Many programs have become accustomed to classes of 15 - 30 pupils per instructor. To make matters worse, too many classes are crowded together in a small area. This forces a military-like system on the instructor that is destructive to learning in his pupils. Class size should be 10 - 15 per instructor. Only the most experienced, skillful, and well-trained can do good work with classes over 15. Because classes of up to 40 have "always been the case" is no justification whatever to continue this practice. The minimum pool surface area required for efficient instruction can be calculated by an experienced instructor simply by asking: "How many beginners (or advanced) learners can I handle reasonably well in the area of the pool I have to work in?" Divide this number into the area in square feet of the pool area you work in, and you have it. For example, say a class in a pool 30 feet wide is given 25 feet of the pool length. This is 750 square feet. If a class of 10 children can be handled efficiently this means 750 divided by 10, or 75 square feet each.

Minimum areas per swimmer recommended by the American Association for Health, Physical Education and Recreation (1955) are as shown on the next page. The figures mentioned are all minimum. Experience has convinced the writer that a more realistic, practical figure for teens or adults, for either advanced or beginning instruction is 60 to 75 square feet per class member in shallow water rather than the minimum figures as shown in the table.

Minimum Recommended Occupancy

Design Factors

Activity	Indoors Pools	Outdoor Pools
Shallow Water Area (Under 5'0")		
Recreational Swimming	14 sq.ft./person	15 sq.ft./person
Advanced Swim Instruction	20 sq.ft./person	25 sq.ft./person
Beginning Swim Instruction	40 sq.ft./person	45 sq.ft./person
Deep Water Area (Over 5'0")		
Recreational Swimming	20 sq.ft./person	25 sq.ft./person
Advanced Instruction	25 sq.ft./person	30 sq.ft./person
Diving (based on area within 30' of deep-end diving wall)	175 sq.ft./person	200 sq.ft./person

Of course, it is easy to schedule classes of any size into a given facility. It is inevitable though that as classes get larger, regimentation increases; waiting time to "get a turn", increases; collisions and confusion increase. However, once class size, and the number of classes using a pool at the same time are brought into line, it is possible for instructors to be more flexible in their handling of pupils. They can begin and end trials without having to have formal signals from the instructor controlling every move. Pupils should also be encouraged, at times, to work in pairs, helping each other with things the instructor has them working on. In many traditional classes this is now forbidden! Can any of us recall how much we would not now know if we had never been allowed to receive help from friends or classmates in learning something that we found difficult?

Use of Appropriate Language

The instructor must learn to avoid using words and terms that confuse learners. To speak of the "whip-kick", "bent-arm crawl", "late breathing", in a stroke, and other such things is to be guilty of using jargon to confuse. If a doctor explains a disease to us he must be able to do so without using medical jargon or he will simply confuse and annoy us. Plain words that are known to the learners, describing as simply as possible what is to be done, will produce the best results. The time to pin a label on something like the "bent-arm action" of the crawl is after the learner has pretty well learned to do it. To begin with it will be helpful to say something like: "As you pull your hand through the water see if you can keep the palm pressing water straight back. You will have to bend your wrist and elbow to do it. After pupils have experienced how the water holds them up is the time to begin using the term buoyancy. They have something real on which to hang the lable. Before that time, jargon is most likely to confuse or discourage.

One further example. To introduce the kick for the elementary back stroke the instructor, while lying on his back on the deck with his legs over the water might say: "Try this way of kicking. Drop both feet down in the water together like this. Don't lift your knees up. Then circle your feet away from each other. See the circle each foot makes? Try it." He may even eliminate all or most of it in the water, in a back floating position with or without buoyant aids as each prefers.

Some Parting Tips

Remember that variety is stimulating. Change activities every 5, or at most, 10 minutes. Some things may only take 2 or 3 minutes before you move on.

The instructor should not think of himself as the one who teaches everything that is learned during the class. Rather his most important job is to create conditions under which learning takes place. A great deal of valuable learning occurs in every class that cannot be attributed to the direct efforts of the teacher.

To be effective, the instructor must constantly strive to learn as much as possible about technique of strokes and other skills but he must not concern himself too much with picky details. He must also develop his ability to analyze accurately his pupils attempts to swim. Finally he must improve his ability to communicate (this is a two-way thing) with his pupils so that his efforts will result in learning by both him and his pupils.

Summary

We learn by doing, not by watching or listening to lengthy explanations and demonstrations. Short snappy demonstrations without too much detail are best. Gradually add details as the class gets the hang of the idea. The class should seldom be stopped for more than two or three minutes. Make clear what you want and let them have a go. After a few trials stop them for 10 to 30 seconds, reemphasize a point or add a new detail. Whole-part or progressive-part methods should predominate.

Early practice of new things should not be judged as to success or failure. Learning always involved mistakes. Let pupils make them without being bugged. All of us appreciate this kind of freedom when we're just learning something.

Try to arrange things so that as he practices, the pupil gains information as to his progress . . . feedback. The pupil should get feedback that will do two things: (a) if he is successful he will be motivated to continue. Nothing succeeds like success. (b) if he makes errors the information he gets from these errors should help him to correct them, it should not discourage him.

In developing difficult skills, keep competition with others out of it until some progress has been made. The pupil has enough to think of at first without worrying about beating (or being beaten by) others.

More learning takes place if success is possible but not certain. Making things either too easy or too difficult is not good.

Group your class in different ways at different times. Sometimes the skilled ones should work together on something more difficult while the less skilled work on a simpler fundamental. At other times pair a poor performer with a better performer so that the latter can help his classmate. Do not make pupils waste time on something they can already do well.

Variety is stimulating. Change activities (or drills) every 5 or 10 minutes. It is better to spend three, ten-minute sessions on a skill than to spend one thirty-minute session on that skill.

As soon after a lesson as possible, try to decide what was effective about it, what was not so good, and what should be avoided in the future. Also think about what needs more attention and practice. Plan the next lesson after having given some thought to where the class is now and how many lessons remain.

Keep your attitude open to learning new things. In this way your work will not only be more effective but will be more exciting for you.

REFERENCES

American Association for Health, Physical Education and Recreation. The Athletic Institute. Planning Areas and Facilities for Health, Physical Education, and Recreation.

Counsilman, J. E. The Science of Swimming. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1968.

Cratty, Bryant J. Movement Behavior and Motor Learning. Philadelphia: Lea and Febiger, 1964.

Cureton, Thomas K. Jr. How to Teach Swimming and Diving. Vol. 1. New York: Association Press, 1946. (Originally published by the YMCA, 1934).

Gates, A. I. et al. Educational Psychology. New York: The McMillan Co. 1948.

Lewellan, J. D. "A Comparative Study of Two Methods of Teaching Beginning Swimming." Unpublished Doctoral dissertation, Stanford University, Stanford, 1951.

Mohr, Dorothy R., and Barett, Mildred E. "Effect of Knowledge of Mechanical Principles in Learning to Perform Intermediate Swimming Skills.' Research Quarterly, 1962, Vol. 33, No. 4, 574 - 580.

Neimeyer, Roy K. "Part Versus Whole Methods and Massed Versus Distributed Practice in the Learning of Selected Large Muscle Activities." 62nd Proceedings Annual Meeting of the College Physical Education Association, 1958, 122 - 125. Washington: N.E.A., 1959.

Pape, L. A. and Means, L. E. A Professional Career in Physical Education Englewood Cliffs: Prentice-hall, 1963.

Taba, Hilda. Curriculum Development: Theory and Practice. New York: Harcourt, Brace and World, Inc., 1962.

APPENDIX E

FLANDERS' INTERACTION ANALYSIS SYSTEM (FIAS) AND GROUND RULES

FLANDERS' INTERACTION ANALYSIS SYSTEM (FIAS) AND GROUND RULES

Teacher Talk	Indirect Influence	1. Accepts feeling: accepts and clarifies the feeling tone of the students in a nonthreatening manner. Feelings may be positive or negative. Predicting and recalling feelings are included.
		2. Praises or encourages: praises or encourages student action or behavior. Jokes that release tension, not at the expense of another individual, nodding head or saying "uh huh?" or "go on" are included.
		3. Accepts or uses ideas of student: clarifying, building, or developing ideas or suggestions by a student. As teacher brings more of his own ideas into play, shift to category five.
		4. Asks questions: asking a question about content or procedure with the intent that a student answer.
	Direct Influence	5. Lectures: giving facts or opinions about content or procedure; expressing his own idea; asking rhetorical questions.
		6. Gives directions: directions, commands, or orders with which a student is expected to comply.
		7. Criticizes or justifies authority: statements, intended to change student behavior from nonacceptable to acceptable pattern; bawling someone out; stating why the teacher is doing what he is doing, extreme self-reference.

Student Talk	8. Student talk-response: talk by students in response to teacher. Teacher initiates the contact or solicits student statement. 9. Student talk-initiation: talk by students, which they initiate. If "calling on" student is only to indicate who may talk next, observer must decide whether student wanted to talk. If he did, use this category.
	10. Silence or confusion: pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.

Ground Rules[1]

Because of the complexity of the problems involved in categorization, several ground rules have been established. These rules of observation aid in developing consistency in trying to categorize teacher behavior. They have been useful in working in classrooms with all subject areas and at all grade levels.

Rule 1: When not certain in which of two or more categories a statement belongs, choose the category that is numerically farthest from category 5.

Rule 2: If the primary tone of the teacher's behavior has been consistently direct or consistently indirect, do not shift into the opposite classification unless a clear indication of shift is given by the teacher.

Rule 3: The observer must not be overly concerned with his own biases or with the teacher's intent.

---

[1] For a detailed explanation of the ground rules see Amidon and Flanders, 1967, pp. 21-24.

Rule 4: If more than one category occurs during the three second interval, then all categories used in that interval are recorded; therefore, record each change in category. If no change occurs within three seconds repeat that category number.

Rule 5: If a silence is longer than three seconds, it is recorded as a 10.

APPENDIX F

HOUGH'S OBSERVATIONAL SYSTEM FOR INSTRUCTIONAL ANALYSIS (OSIA) AND EXTENDED GROUND RULES

HOUGH'S OBSERVATIONAL SYSTEM
FOR INSTRUCTIONAL ANALYSIS
(OSIA) AND EXTENDED GROUND RULES

Indirect Teacher Verbal Influence[1]

1. Affective Clarification and Acceptance: Includes the acceptance, clarification and recognition of students' emotional states. Statements which deal in a non-evaluative way with student emotions and feelings, i.e. fear, anger, anxiety, happiness, pleasure, etc., are included in this category. Such statements may recall or predict student feelings or may be a reaction to current emotional states of students. Statements of encouragement which do not praise or reward or do not deny expressed student feelings are also included in this category.

2. Praise and Reward: Includes statements with a positive value orientation directed at student behavior. Statements praising or rewarding current behavior as well as statements of praise or reward for previous or predicted future behavior are included in this category. Also included are statements which indicate teacher agreement with student behavior and thus by implication express teacher feelings regarding the value of the behavior.

3. Cognitive and Skill Clarification and Acceptance: Includes statements that show acceptance of, or are designed to clarify, student ideas or performance, but are nonevaluative. Statements that repeat or paraphrase what a student has said or that are designed to help the student think through what he has said or done are included in this category. Also included are such statements as "um hum", "go on", and "OK", when such statements are not said with an inflection that connotes praise or do not represent habitual teacher behavior.

4. Teacher Questions: Includes questions to which answers are expected, but do not serve the function of other categories. Such questions may be about content or procedure or may ask for student opinion regarding content or procedure.

---

[1] Hough, 1967.

5. Response to Questions: Includes direct answers to student questions. Such answers may give information or opinion but must be responses that answer or are directed toward answering student questions.

Teacher Direct Influence

6. Initiates Information or Opinion: Includes all statements regarding content or process that give information or opinion. Also included in this category are rhetorical questions.

7. Corrective Feedback: Includes statements that are designed to indicate the incorrectness or inappropriateness of behavior so that the student sees that his behavior is incorrect or inappropriate. Such teacher statements are restricted to cognitive or skill areas in which behavior can be considered correct or appropriate by definition, by generally accepted convention, or by being empirically validated as fact.

8. Requests and Commands: Includes directions, requests and commands to which compliance is expected. Also included are questions preceded by a student's name after a question has been asked which the student has not indicated a readiness to answer.

9. Criticism and Rejection: Includes statements that criticize or reject student ideas or behavior without reference to clearly identifiable authority (i.e., definition, common convention, or empirically validatable fact). Also included in this category are sarcasm and rejection or denial of student feelings.

Student Verbal Behavior

10. Elicited Responses: Includes conforming responses to narrow questions, commands, and requests, and all responses which are highly predictable as a function of their having been previously associated with a specific stimulus or class of stimuli. Also included are incorrect responses to narrow questions, commands, or requests, such statements as "I don't know", and unison responses either verbal or nonverbal.

11. Emitted Responses: Includes responses to broad questions

or requests which have not been previously associated with specific stimuli or a class of stimuli. Also included are statements of opinion, feeling, and judgment.

12. Student Questions: Includes comments which ask for information, procedure, or opinions of the teacher or another student.

Silence

13. Directed Practice or Activity: Includes all nonverbal behavior requested or suggested by the teacher. Working problems, silent reading, etc., are included in this category. This category is also used to separate student-to-student interaction.

14. Silence and Contemplation: Includes all instances of silence during which students are not overtly working on problems, reading, etc. Silence following questions and periods of silence interspersed with teacher or student talk are also included in this category, as are periods of silence intended for purposes of thinking.

15. Demonstration: Includes periods of silence when chalkboard, felt board, pictures, filmstrips, motion pictures, etc., are being used to present information or when a nonverbal demonstration is being conducted by the teacher.

Nonfunctional Behavior

16. Confusion and Irrelevant Behavior: Includes all occasions when more than one person is talking and neither person can be understood (excepting unison responses), or when the noise level in the class is so high that the person speaking cannot be understood. Also included in this category are confused behavior in response to a command, or direction, irrelevant comments that have no relation to the purpose of the classroom, and nonfunctional periods of silence such as when the teacher answers and talks on the classroom telephone.

ADDITIONAL GROUND RULES FOR APPLICATION OF HOUGH'S OSIA TO CHILDREN'S SWIMMING CLASSES

1. Category 1. "Here we go", with a reassuring and encouraging inflection is directly related to the learners' emotional state. Should be tallied as 1 when directed at an anxious learner who is reluctant to risk a task.

2. Category 2 or 9. A laugh by the teacher in response to a question, idea, or performance by a learner will be a 2 if it shares or reassures the learner, a 9 if it embarrasses or ridicules.

3. Categories 2, 3 or 6. "OK" is a 2 when the inflection implies praise ("OK!") and a 3 when neutral and in the sense of, "Yes, go on." with no evaluative overtones. It may also be a 6 if uttered neutrally or with a tone indicating "well, that's that, let's move on to something else." For example, "OK, now we'll do some diving." This indicates information being imparted to the class.

4. Categories 5, 12 and 13. A learner who asks for the teacher's attention by saying his name with the voice rising, "Mr. Smith?" is in fact asking a question and should be recorded as a 12. The teacher's verbal response, "Yes," or "Uh huh" is a 5. If two children call for attention with no response from the teacher in between it is tallied as 12, 13, 12 since 13 is used between two different speakers.

5. Categories 6, 8 and 9. A request for a specific activity response that contains only sufficient information as to what to do is an 8. Repeating the same phrase or phrases is also an 8. Preceding or inserting a learner's name in such a way as to indicate "Please pay attention", is also an 8. If the name is said with a distinctly critical force and/or facial expression, it is a 9. When the essential instructions are elaborated on as to coaching or performance detail, or by giving reasons, it is tallied as 6.

6. Category 7 or 8. A request for a specific activity response that is based directly on teacher observations of performance in the preceding episode is corrective feedback and recorded as a 7 rather than as an 8.

7. Categories 11, 12 and 13. As children engage in di-

rected activity and talk excitedly among themselves record 13 because the talk is irrelevant to the activity and pupil-teacher interaction. If emitted responses 11, or questions 12, are obviously or apparently directed to the teacher, score these appropriately as 11 or 12.

8. Categories 13 and 16. Ignore normal period between teacher request for attention and next recorded behavior. This normal period is a direct result of the environment and interference with normal hearing because of submersion and so on. It is neither functional activity nor nonfunctional. If this period involves following directions to "come over here", or "Put the boards away", it is functional and is recorded as 13. If behavior becomes nonfunctional or is prolonged by confusion, record 16. It is also 16 if the children have no obvious task assigned for more than three seconds. When the teacher is off-camera and/or talking so quietly that he cannot be heard with any reasonable clarity, record 13 or 16 as appropriate.

9. Category 14. When the teacher directs the class to rest, or the class rests with the apparent approval of the teacher, record 14.

10. Category 15. Use 15 for silent segments of demonstrations by the teacher or by a learner under teacher direction for benefit of class as a whole.

APPENDIX G

SCHEDULE FOR PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEW

SCHEDULE FOR PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEW

A woman member of the staff of the Faculty of Physical Education interviewed all of the girls participating in Phase One. She was experienced in working with children in the seven to ten year age-range. The investigator interviewed the boys. Because the children were not familiar with the interviewers and since being interviewed was a new and confusing situation for them, the interview usually began with some casual discussion designed to help establish rapport. The questions were not necessarily asked in the order indicated below. During the interview the interviewer scanned the questions and ensured that all areas had been covered adequately.

INTERVIEW

1. Do you ever go swimming?
   How often?
   With whom?
   Where? (Lake, public pool, private pool)

2. Do you like swimming?
   Why?
   Why not?

3. Do you sometimes feel afraid around water?
   Why?
   Are other people (family, friends) afraid sometimes?

4. Does your mother (or anyone) tell you to watch out for, or be careful of, water?
   Tell me about it.

5. Do you ever go to the swimming pool to swim?
   Which pool?
   Winter?
   Summer?
   With whom?
   How often?
   What do you usually do there?
   How do you like the watcr at the pool?

6. Do you go to the lake in the summer with your family?
   With friends?
   Tell me about it.
   What do you do?
   Do you go out in boats?
   Tell me about it.
   How do you like the water at the lake?
   Do you ever feel afraid around water?
   Tell me about it.

7. Does your mother like to swim?
   Tell me about it.
   Father?
   Sisters?
   Brothers?

8. What do you like best about the pool?
   The lake?
   Camping?
   Fishing?
   What don't you like about it?

9. What do others, particularly parents, tell you about what to do - to watch out for around water?

APPENDIX H

PHASE ONE: LETTER TO PARENTS

Faculty of Physical Education,
The University of Alberta,
Edmonton, Alberta,
May 21, 1971.

This is to let you know that the swim lessons at the University are progressing very well and the children are all improving considerably. I have made a short note at the bottom about your child in particular.

Let me remind you how much we appreciate your co-operation in this project and we hope that you feel the benefits to your child make it worthwhile to you and him or her.

Because of the school holiday there will be no class on Monday, May 24th. Instead, classes will be held next week on Tuesday, May 25th, Wednesday, May 26th and Friday, May 28th.

The last class will be held on Monday, May 31st. We would like the children to come for a final testing session on Tuesday, June 1st, after which we plan to take them for a picnic and weiner roast to a nearby park.

Sincerely,

Murray Smith,
Associate Professor.

MFRS:djs

APPENDIX I

PHASE TWO: LETTER TO PROSPECTIVE INSTRUCTOR TRAINEES

Department of Educational Services,
Faculty of Physical Education,
The University of Alberta,
Edmonton 7, Alberta, Canada,
July 6, 1971.

Dear

As a student who has applied for admission to the Faculty of Physical Education, you may be interested in the project described below.

I am conducting a study into an approach for teaching children to swim. Part of the study requires training a group of two male and two female instructors to use the approach and then having them teach a class of young children to swim.

To be eligible for involvement, you have to have applied for admission to Physical Education, be a reasonable swimmer, but have had no previous swimming instructor training or experience.

If you are interested call me at 432-3652 for further details.

Sincerely,

Murray Smith,
Associate Professor.

MS:djs

APPENDIX J

LESSON PLANNING GUIDE

LESSON PLANNING GUIDE

DATE: LESSON # AGE GROUP: INSTRUCTOR:

	A	Class Profile Last Lesson		B	Activities for Next Lesson
		Low	Med		
(1) Explore and Orientation					
(2) Buoyancy					
(3) Front Float (Stretched)					
(4) Back Float (Straight)					
(5) Propulsion 0-30' (Front)					
(6) Weight on Hands					
(7) Propulsion 0-30' (Back)					
(8) Entry-Jump or Elem. Dive					
(9) Deep Water Orientation					
(10) Return to Start					
(11) Distance 30'-600'					

APPENDIX K

PHASE TWO: INFORMATION TO PARENTS

THE UNIVERSITY OF ALBERTA
SWIMMING STUDY, PHASE 2

July 23, 1971

We have no means ourselves of transporting children to and from the University. For that reason, children will either have to live close enough to walk back and forth or be brought by a parent of some other responsible person. If you are beyond walking distance and require a ride, we will try to arrange a ride with someone near you.

1. Do you live close enough for your child to get back and forth to the University on his own?

   Yes ☐ No ☐

2. If it is too far to walk would you be able to arrange to bring him or her to the classes?

   Yes ☐ No ☐

3. If you were to drive your child to the University, would you be willing to assist by bringing other children who might live near you and are also in the classes?

   Yes ☐ No ☐

4. Present plans are for the 7 and 8 year-olds to come for classes Monday-Wednesday-Friday at 6:00 p.m. beginning Wednesday, August 4th. The 9 and 10 year-olds would come the same days at 6:45 p.m. In case Friday is impossible for some families we may be able to arrange classes for Monday-Tuesday-Thursday instead. Please check one below:

   a) Monday-Wednesday-Friday would be OK. ☐

   b) Cannot come Monday-Wednesday-Friday but Monday-Tuesday-Thursday would be OK. ☐

5. Portions of the classes would be videotaped but the tapes will be used for educational purposes only. For example, they would never be shown on public television and children would be referred to during the classes by first names only and never in a critical way.

6. Between the test session and the beginning of lessons we would want to conduct a short interview and give the children a paper and pencil test.

7. I have read the attached letter and the above statements and give my permission for:

____________________ of __________________________,
(name) (address)

________________, __________, to take part in the test
(phone) (age)

sessions and, if selected, in the swimming lessons.

______________ ____________________________________
(date) (signature of parent or guardian)

PLEASE RETURN TO THE PLAYGROUND SUPERVISOR

APPENDIX L

OSIA TALLY FORM

OSIA TALLY FORM

REEL: LESSON # 7-8: 1A 2A 2B INSTRUCTOR:
9-10: 1B 2C 2D

DATE: OBSERVER: COMMENTS:

1			1			1		1		
2						2				
3						3				
4						4				
5			5			5		5		
6						6				
7						7				
8						8				
9						9				
10			10			10		10		
11						11				
12						12				
13						13				
14						14				
15			15			15		15		
16						16				
17						17				
18						18				
19						19				
20			20			20		20		
21						21				
22						22				
23						23				
24						24				
25			25			25		25		

APPENDIX M

EXCERPTS FROM PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEWS

EXCERPTS FROM PRE-INSTRUCTIONAL AUDIOTAPED INTERVIEWS

Pupil A3[1]

Q: And do you go and play in swimming pools sometimes, or do you not go to swimming pools?	A: Well, we went to one Monday but the only one I've been to before that was one of those little plastic ones. And that was our neighbours.
Q: And did you like that? But you couldn't swim in that - it was a bit small wasn't it.	A: No, it was too small.
Q: What does it feel like when you're going into the water in the swimming pool?	A: It feels cold.
Q: Does it? Do you like the feeling of it tickling up your legs?	A: Yeah.
Q: And tickling up to your tummy, do you like that?	A: Yeah.
Q: Does Mummy want you to go and swim? Does your mummy swim?	A: No, she's never owned a bathing suit.
Q: Does she like water or is she afraid of the water?	A: She likes water but she doesn't like to swim.
Q: She likes water but she doesn't like to swim?	A: Well, she'd like to swim but she can't.
Q: Why?	A: She's looking after the twins so much.

---

[1] See Tables 2 and 3 for information regarding background and performance of these children.

Q:	Oh, because she's so busy. How about Daddy? Does he like to swim?	A:	Yeah.
Q:	Have you ever seen him swim?	A:	No.
Q:	Won't they be surprised when you show them how you can swim?	A:	Well, I guess so.
Q:	Now, if you're going anywhere near water does anybody tell you anything?	A:	They'd say don't fall in.
Q:	Is that what they'd say. I wonder why they always say "Don't fall in." Why don't they want you to fall in, I wonder?	A:	Because there might be glass and sticks in the water.
Q:	Yes, and when they say "Don't fall in", do they tell you anything else about water?	A:	No.
Q:	Just to be careful not to fall in, huh?	A:	Yup.
Q:	And get everything wet and muddy and dirty.	A:	Yup.
Q:	Then they've got to wash it haven't they?	A:	Yes.
Q:	So, when are you going to come swimming?	A:	The first is the 10th.
Q:	Is that going to be good? Do you want to come?	A:	Yes.
Q:	And why do you want to do it?	A:	'Cause I want to learn how to swim because we are going to go down to Viking and if I can swim maybe I can go in the Coulee's Lake.

Q: Oh, that will be good won't it?	A: Yes, but Mummy says it's all full of beavers now.
Q: Oh, you'll swim with the beavers then.	A: Oh, no way!
Q: Why?	A: 'Cause I don't like beavers.
Q: Why? They're nice little animals aren't they?	A: Well, they got all the twigs and glass, they got all the twigs in the coulee water. 'Cause see we used to go there and puddle with our shirts on.
Q: I see, but the water was too dirty to swim in, was it? You didn't like swimming in it.	A: No.
Q: Because it was too dirty, you like swimming in nice clean water.	A: Yes.
Q: Yes, so do I.	

Pupil A8

Q: We're at Queen Alex School and the first boy we're going to talk to is A8. Would you tell me again please, how old you are?	A: Seven.
Q: Seven, and when is your birthday?	A: May the 11th.
Q: And you'll be eight years old on May the 11th?	A: Yes.

Q: Very good. Now, do you ever go swimming A8?	A: No.
Q: Do you ever go to the lake?	A: Yes.
Q: Where do you go to the lake? Whom do you go with?	A: My dad and my mom. All my family too.
Q: How many brothers and sisters do you have?	A: I have ......
Q: How many sisters do you have?	A: Two.
Q: And how many brothers, a couple or three?	A: I think it's five.
Q: You think it's five? That's quite a few so there's a lot of children isn't there?	A: Yep.
Q: Do any of your brothers or sisters take you to the swimming pool?	A: No.
Q: Have they ever taken you to the swimming pool?	A: No, not yet.
Q: They will, later probably. In the summer you go to the beach for picnics sometimes though, don't you?	A: No.
Q: What do you do?	A: I go to the farm and my sister and me we ride the horses.
Q: You're lucky. And do you go in boats?	A: No.
Q: You don't? Do you like swimming?	A: Yes.

Q: Do you? How do you know if you haven't been swimming?	A: Well, it's easy to know that, see my mom never takes me nor my family.
Q: But you'd like to go, eh? How do you feel when you're around water?	A: I don't know - kind of happy.
Q: Anything else?	A: Nope.
Q: Do you ever feel a bit scared around the water?	A: Yeah, sometimes.
Q: What makes you scared around the water, do you know that?	A: Well, sometimes I see little crabs all around.
Q: Little crabs, anything else?	A: Sometimes little fish what come on shore what's dead sometimes.
Q: Is that right? And what do you think about that?	A: I always think poison crabs get them.
Q: Poison crabs get them eh? Would they get you if you went in the water?	A: I think they would.
Q: Do your brothers and sisters and your mother and dad like the water?	A: Yeah.
Q: Do they go to the swimming pool sometimes?	A: My sisters and brothers do.
Q: The older ones.	A: Yes.
Q: Are any of them afraid of the water do you think?	A: Just some, my sister in grade one and me.
Q: Are you the youngest, you and your sister?	A: No, my baby brother is.
Q: You've a baby brother? How old is he?	A: He is one years old.
Q: One years old, is he nice?	A: Yeah.
Q: What's his name?	A: Darwin.

Q: But the others are not afraid of the water, eh, except you and your little sister, and Darwin? Does Darwin like to have his bath?	A: He just likes it, he doesn't want to get out of the bathtub, if my mom says he has to, he doesn't want to.
Q: Did you like taking a bath too when you were little?	A: Yes.
Q: Can you remember that?	A: Yes.
Q: Do you like taking a bath now?	A: Yes
Q: When you go near the water does your mother tell you anything to watch out for?	A: Yes.
Q: What does she tell you?	A: Look out for crabs and that.
Q: Does she tell you that?	A: Yes.
Q: What does she say to you?	A: Look out for crabs and ------ sometimes she says look out for some snakes.
Q: Mmm -- snakes, does your mother like snakes?	A: No.
Q: How do you know?	A: See, once at our farm a snake came out of the bush, my mom got so scared she ran into the house.
Q: Does anybody else tell you anything to watch out for around water?	A: Not really.
Q: How do you think it will be taking swimming lessons?	A: I don't know.
Q: You don't know, do you think you're going to like it?	A: Yeah.

Q: I think you will too.
OK, thanks very much.

Pupil All

Q:	Would you like to go to Scona?	A:	No.
Q:	Why not?	A:	There are boards and they have lifeguards, but we just fool around and the lifeguard can't see that well if he doesn't have any glasses on when he's supposed to.
Q:	Well, do you think lifeguards should have glasses on?	A:	Well, if they can't see that well I think so. That's what they're there for, to look - and save.
Q:	Do you wear glasses?	A:	No.
Q:	If you were a lifeguard then, would you have to wear glasses?	A:	Not unless my eyes are bad.
Q:	I see, very good. So do you ever go to the lake All?	A:	A lake? Yes we go to our own lake and we go boat riding.
Q:	What's your own lake? Do you know what the name of it is?	A:	Well, my Auntie Janet goes to it too. No, I don't think there's really no name for it.
Q:	Have you ever been in a boat?	A:	Yes.
Q:	Tell me about it.	A:	Well, it's quite fun, you can fish in it and you can take nets and catch them but something can be awful dangerous.

A: You have to make sure that the water is quite not so low down, you have to be quite deep so that the bottom won't hit the sand and you be rocking back and forth. You have to have clear water so you can see through it.

Q: Do you think when you learn to swim you'll go to Scona with your sister?

A: I don't know about there, I don't like Scona. I tried it before but it's not so safe.

Q: It isn't so safe eh?

A: No, because there's a whole bunch of diseases and you know a bottle fell in it and it's crushed at the bottom and it's still in there and they can't get it out.

Q: Do you think so? Gee, I think a lot of people would get cut feet if that was the case. I'm not sure they do.

A: They're not so clean - there's quite a few diseases.

Q: Do you think there are?

A: Yeah, people go. The mothers say to stay at home if they have a cold and then they say "No, I don't wanna" "I wanna go I don't want to miss going". And so they go and then they cough and maybe they just throw up in the water and you know some little ones they go to Scona and you know they get so excited you know they go to the bathroom in it. You know, urine.

Q: I see, urine. What about the University pool?	A: The University? It's quite clean.
Q: Is it?	A: I think so, it's not so shallow.
Q: I see, does your mother and dad tell you how to behave when you're around water All?	A: Yes.
Q: What do they tell you?	A: Well, they tell me not to fool around because it can be very dangerous. Like, if you're going to play in the water, play safely. Don't just fool around and duck your head and go under and act smart. You know you can just as easily like you're going to dive off the big diving board and you're only that big and so you want to be smart and so you dive in and you're really shivering when you go down and you just land down like that and like that picture over there - that man's holding a boy. And well you see it isn't so safe because ... that's all my Mum and Dad told me because they don't think it's so safe just to play around acting smart in water.
Q: And how do you feel again about starting lessons today? You're going to start this afternoon. How do you feel about that?	A: I feel good.
Q: Good, well I'll see you this afternoon. Thanks.	

Pupil B8

Q: Do you ever go to the swimming pool?	A: Well, I've never been there yet.
Q: Have you been to the lake?	A: Yes, but I never swam yet.
Q: Who do you go to the lake with?	A: My Mother and Dad and brothers and sister.
Q: Are they bigger or littler than you?	A: I've got one brother bigger than me and the other brother's smaller than me and my sister's younger than me.
Q: How old is she?	A: 20 months.
Q: Does she like to have a bath?	A: Yes.
Q: Did you like to have a bath when you were little?	A: Right now I can't remember.
Q: Do you think you liked it?	A: I think so.
Q: Do you like to have a bath now?	A: Yes.
Q: So you probably'll like to swim.	A: Yes, I would.
Q: You don't go to the lake though, eh?	A: Well, once in a while.
Q: Do your Mother and Dad swim at the lake?	A: No, my Dad's the only one that knows how to swim in the family.
Q: And does he swim at the lake sometimes?	A: ....When we lived at Canyon Creek we mostly did swim in the water because we lived by Slave Lake - just about a mile from it.

Pupil B1

Q: Do you get to go to the lakes here at all?	A: Yes.
Q: Which lakes? Do you know?	A: Alberta Beach.
Q: Who takes you to Alberta Beach?	A: Well, my dad does, but he can't now.
Q: Why?	A: He's in Japan.
Q: Oh, is he? Gee, when's he coming home?	A: Well, he should be coming home around the end of May.
Q: Then he'll be able to take you in the summer again, won't he? Won't that be great?	A: Yes.
Q: And what happens when you get to Alberta Beach - do you swim?	A: Not really.
Q: Well, what do you do?	A: Splash.
Q: You splash in the shallow parts? How do you like splashing?	A: It's fun.
Q: Yes, it is, isn't it? Does Daddy swim?	A: Not very much.
Q: But he can swim, can he?	A: I don't know.
Q: How about Mummy - does she swim?	A: I've never seen her swimming.
Q: Oh, does she take you to Alberta Beach?	A: With Daddy, yes.
Q: Have you got any brothers or sisters?	A: I've got two sisters and one brothers.
Q: Are you the youngest?	A: Nope - I'm the middle one.

Q: Oh, who's above you.	A: Justine.
Q: That's one of your sisters.	A: Yeah.
Q: Does she swim?	A: Yes.
Q: Does she swim a lot at Alberta Beach with you?	A: Yes.
Q: Has she ever tried to teach you to swim?	A: Well, we had lessons but we only got to the first one but I flunked out.
Q: What lessons did you have?	A: Well, we had swimming lessons but we never really got to swimming.
Q: Tell me about that will you? Where did you have swimming lessons?	A: At Queen Elizabeth - down there.
Q: And you had swimming lessons but you never got swimming lessons. Explain. Tell me what you did.	A: Like, we did the floating and the jelly fish float and all that but when it came to swimming they were over - it was over.
Q: Oh, so you just got to learn to jelly fish float and you never got to learn to swim?	A: Nope.
Q: And how many lessons did you have?	A: Well, I had two years of this same grade but they just did the same things over.

Pupil B3

	A: I take lessons at University pool every Monday, Wednesday and Friday.

Q: You're going to start taking those aren't you? Have you had any lessons before?	A: No.
Q: Are you looking forward to them?	A: Yes.
Q: Did you like the pool when you went in it the other day?	A: Yes.
Q: Were you scared?	A: No.
Q: You weren't scared at all, that's good! Do you ever go and play in the lake water anywhere?	A: Yes.
Q: Which lake, do you know?	A: I've been to Half Moon Lake.
Q: Oh, have you? Was that nice at Half Moon Lake?	A: Yes.
Q: What did you do?	A: I put my swim suit on and we ate there and I tried and tried to swim but I couldn't do it.
Q: Why couldn't you? What happened?	A: I just kept sinking.
Q: You try and try and your feet keep sinking. Isn't that annoying. So you're going to try and try so that you can swim this summer, huh?	A: Yes.
Q: Does Mummy swim?	A: Yes.
Q: Does she like the water, or not?	A: She doesn't like going to the lake that much.
Q: Doesn't she? She thinks the water is a bit cold does she?	A: Yes.
Q: Have you seen her swim?	A: Yeah.

Q: Is she a good swimmer?	A: Yeah.
Q: How about Daddy?	A: He doesn't like swimming.

Pupil B12

Q: And you're how old B12, again?	A: Nine.
Q: And you're in Grade 3 at McKernan School?	A: Right.
Q: You were telling me a while ago about taking swimming lessons. Where did you take those lessons?	A: At Scona.
Q: About how many kids were in the class?	A: About six.
Q: And how many lessons did you go to?	A: Just one.
Q: Can you tell me about what happened in that lesson?	A: Well, I didn't, well first they told us to see what you can do in the water and everybody lined up and some guys swam, one I think did dog paddles, everything like that. When I went in there I thought I could maybe swim you know. So I thought it was easy because I saw that boy swim so I went into the water and I just about sank right to the bottom but I came up again you know and they asked me if I could do anything else and I said I couldn't so I got into our classes and they said

	can you put your head under the water and for a period of time you know and some guys did and I didn't really feel like doing it because I wasn't that used to it and then they had this hockey puck. And they put it to the bottom, my teacher, and now we had to go down and get it and I didn't really want to do that either because I didn't, I wasn't used to the water that much.
Q: And there was one puck and all the boys were trying to get it?	A: Yes.
Q: All the boys were trying to get the same puck. Were there just boys in the class?	A: No, girls and boys. Well, only two boys, me and this other guy, and all the others girls.
Q: I see, so two boys and four girls eh?	A: Yes.
Q: And did everybody go after the puck?	A: Yeah.
Q: But you didn't. You didn't try to go after it?	A: No.
Q: How did you feel about that?	A: Well, I didn't really feel that good you know. I was beginning to feel a little nervous - scared, you know, because I felt sort of a little bit left out and I didn't want to go into the water or anything. I wanted to get out.
Q: You felt because they were able to do those things and you couldn't eh?	A: Yes.

Q: And what else did your instructor try to do to help you to learn to swim in that first lesson, B12?	A: Well, not much really. I can't really remember that much because it was last year.
Q: It was a year ago when you think you were about eight years old, eh? How do you feel, B12, when you're around water, like the ocean or a lake or a river?	A: Well, I just feel like I'd like to get in there and swim.
Q: It really looks inviting and you'd like to get into it. And you said you were in a canoe. Was that exciting?	A: Yes.
Q: Were you wearing a life jacket?	A: Yes.
Q: How would you feel, do you think, if you were in a canoe and didn't have a life jacket on?	A: Well, I'd feel a little bit scared you know, because if the canoe fell or something I wouldn't be able to swim that good you know. But if I didn't have a life jacket and the boat turned over I could easily just put my hands on the canoe you know.
Q: And hang on?	A: Yup.
Q: That's a very good idea. Have you ever seen your mother and dad swim?	A: No.
Q: Never have, eh?	A: No, they can't swim.
Q: And how do they feel about the water?	A: I don't know but they'd like to learn how to swim.
Q: And you'd like to learn to wouldn't you?	A: Yeah.

APPENDIX N

OSIA MATRICES, PHASES ONE AND TWO

TABLE 1

Phase One: OSIA Matrix, Class 1A, Lesson 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0							2				1					3
2	1	36		10		5	3	29			16	4	50				154
3		5	0	1							2		3		1		12
4		5	1	1		1		5		11	4	1	7		1		37
5		3			0	1		4			1		1				10
6		4		1		2		7			3		5		2	1	25
7		2					0	2				1					5
8		28		7		3	1	43		1	15	5	18		23	1	145
9									0								0
10		2	3	2				2		0			2		1		12
11		19	7	5		5		10			0	1	18		1		66
12		3			10						1	0	2				16
13	2	45		8		7	1	19			23	2	114				221
14														0			0
15		2	1	2		1		20			1	1	1		2		31
16								2								0	2
T	3	154	12	37	10	25	5	145	0	12	66	16	221	0	31	2	739
%	0.4	20.8	1.6	5.0	1.4	3.4	0.7	19.6	0	1.6	8.9	2.2	29.9	0	4.2	0.3	100

I/D = 1.234 S/T = 0.240 Si/Ta = 0.524

TABLE 2

Phase One: OSIA Matrix, Class 1A, Lesson 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	1	1		1				1				1	2				7
2	2	37	2	2		2	16	38			17	6	50		2	1	175
3		9	0	1		4	2	14			2	1	6		1		40
4		1		1		1		6		17	1	1	2				30
5		5			0	1		3			3	3	5				20
6		5		4		16	3	9			4	1	7		2		51
7		20	1	1		2	8	4			2		5				43
8		36	1	7		11	7	39		1	14	7	20		17	3	163
9									0								0
10	1	1	10	1		2		1		0	1		1				18
11	1	14	22	4		5		8			0		9		1		64
12			3		20	1		5				0	2				31
13	2	42	1	8		5	5	23			13	10	83			1	193
14														0			0
15		4				1	2	9			5	1	1		6		29
16								3			2					0	5
T	7	175	40	30	20	51	43	163	0	18	64	31	193	0	29	5	869
%	0.8	20.1	4.6	3.5	2.3	5.9	4.9	18.8	0	2.1	7.4	3.6	22.2	0	3.3	0.6	100

I/D = 1.058 S/T = 0.214 Si/Ta = 0.354

TABLE 3

Phase One: OSIA Matrix, Class 1A, Lesson 5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0	2				2	4	2			1		1				12
2	4	35	4	6		5	18	43			12	12	32		2		173
3	3	6	0			3	4	13			2	1	4				36
4		1	1	1		1	1	6		4	4	1	8				28
5		1			0		1				2	2	8				14
6	1	3		1		5	1	10		1	8		5		6		41
7	2	26					18	5				1	15		1		68
8	1	29	1	7		14	11	63	1		8	5	39		13	1	193
9								1	0								1
10			4					1		0							5
11	1	13	19	6		2	1	5			0	1	7				55
12		5	1		14			1			1	0	11				33
13		46	5	5		7	8	37			12	9	147			2	278
14														0			0
15		6	1	2		2	1	5			4	1			2		24
16								1			1		1			0	3
T	12	173	36	28	14	41	68	193	1	5	55	33	278	0	24	3	964
%	1.2	17.9	3.7	2.9	1.5	4.3	7.1	20.0	0.1	0.5	5.7	3.4	28.8	0	2.5	0.3	100

I/D = 0.8668   S/T = 0.164   Si/Ta = 0.463

TABLE 4

Phase One: OSIA Matrix, Class 1A, Lesson 7

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		10	1	2		3	4	12			6	6	17				61
3			1			2	1	6			1		7				18
4				1		1		1		9	1		3				16
5		2			0		2	2					3				9
6		1		1		12	1	1			2	1	8		1		28
7		3	1				1					3	10				18
8		6		2		7	2	16			6	5	17		1		62
9									0								0
10				5	1					0			4				10
11		4	13	2				2			1		2				24
12		3	1		6			3				0	5				18
13		32	1	3	2	3	6	17		1	7	3	63			1	139
14														0			0
15								2							0		2
16							1									0	1
T	0	61	18	16	9	28	18	62	0	10	24	18	139	0	2	1	406
%	0	15.0	4.4	3.9	2.2	6.9	4.4	15.3	0	2.5	5.9	4.4	34.2	0	0.5	0.2	100

I/D = 0.963   S/T = 0.245   Si/Ta = 0.538

TABLE 5

Phase One: OSIA Matrix, Class 1A, Lesson 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	1	1					1	1				1	1				6
2	2	26	3			5	31	15			8	11	34		1		136
3		6	0	2		1	2	1			1	2	16		1		32
4				0				2		4	3	1					10
5		2	1		0	2					2		8				15
6		3	1	3		40	2	13			3	2	10		4		81
7		21				3	13	3			6	4	21		1		72
8	1	14	2	1	1	14	8	33			7	3	17		3		104
9									0								0
10			2					1		0			1				4
11	1	9	15	2		5	2				1		6				41
12		2	2	1	14	2	2	3			2	0	5				33
13	1	51	6			2	11	30			8	9	134			1	253
14														0			0
15		1		1		7		1							1		11
16								1								0	1
T	6	136	32	10	15	81	72	104	0	4	41	33	253	0	11	1	799
%	0.8	17.0	4.0	1.3	1.9	10.1	9.0	13.0	0	0.5	5.1	4.1	31.7	0	1.4	0.1	100

I/D = 0.774 S/T = 0.171 Si/Ta = 0.496

TABLE 6

Phase One: Combined OSIA Matrix

Class 1A, Lessons 1, 2, 5, 7 and 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	2	4		1		2	5	6			1	3	4				28
2	9	144	10	20		20	72	137			59	39	183		5	1	699
3	3	26	1	4		10	9	34			8	4	36		3		138
4		7	2	4		4	1	20		45	13	4	20		1		121
5		13	1		0	4	3	9			8	5	25				68
6	1	16	1	10		75	7	40		1	20	4	35		15	1	226
7	2	72	2	1		5	40	14			8	9	51		2		206
8	2	113	4	24	1	49	29	194	1	2	50	25	111		57	5	667
9								1	0								1
10	1	3	19	8	1	2		5		0	1		8		1		49
11	3	59	76	19		17	3	25			2	2	42		2		250
12		13	7	1	64	3	2	12			4	0	25				131
13	5	216	13	24	2	24	31	126		1	63	33	541			5	1084
14														0			0
15		13	2	5		11	3	37			10	3	2		11		97
16							1	7			3		1			0	12
T	28	699	138	121	68	226	206	667	1	49	250	131	1084	0	97	12	3777
%	0.7	18.5	3.7	3.2	1.8	6.0	5.5	17.7	0	1.3	6.6	3.5	28.7	0	2.6	0.3	100

I/D = 0.958 S/T = 0.200 Si/Ta = 0.462

TABLE 7

Phase One: OSIA Matrix, Class 1B, Lesson 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		26	5	9	1	6	8	40			10	6	39		2		152
3		13	2	7		3		16			9		14		2		66
4		5	1	0		1		4		23	11		4				49
5		1			0	1		2			6		5				15
6		7		1		15	1	14		2	5	2	7		3		57
7		9					4	1			3	1	5				23
8		39	2	8		14	1	65		2	17	2	29		19	1	199
9									0								0
10			10	7		3		7		0	2		1				30
11		12	41	4	1	7	1	6			4		17				93
12		1			13							0	1				15
13		37	3	9		5	8	34			24	4	88				212
14														0			0
15		2	2	3		2		10		3	2		2		7		33
16				1												0	1
T	0	152	66	49	15	57	23	199	0	30	93	15	212	0	33	1	945
%	0	16.1	7.0	5.2	1.6	6.0	2.4	21.1	0	3.2	9.8	1.6	22.4	0	3.5	0.1	100

I/D = 1.010 S/T = 0.243 Si/Ta = 0.348

TABLE 8

Phase One: OSIA Matrix, Class 1B, Lesson 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0	2						1			4		1				8
2	2	17	5			9	6	28			26	4	29		4		130
3		8	3	2		3	3	18			15	2	17				71
4		1	1	1		3		1		11	3	1	1				23
5		3		1	0	1		7			2	2	3				19
6		11		4		16	2	19		1	6		9		7	1	76
7		14					2	4			1		3				24
8	2	32	2	4		29	2	30		1	21	2	24		7		156
9									0								0
10		1	5	1	1	3		2		0							13
11	2	12	53	3		5		14			3	1	13				106
12		1		2	18			1				1	2				25
13	2	27	1	3		7	9	25			20	12	65				171
14														0			0
15		1	1	2				6			5		3		4		22
16													1			0	1
T	8	130	71	23	19	76	24	156	0	13	106	25	171	0	22	1	845
%	0.9	15.4	8.4	2.7	2.2	9.0	2.8	8.5	0	1.5	12.5	3.0	20.2	0	2.6	0.1	100

I/D = 0.980 S/T = 0.284 Si/Ta = 0.298

TABLE 9

Phase One: OSIA Matrix, Class 1B, Lesson 4

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0							1									1
2	1	13	2	3		8	19	27			19	4	22		1		119
3		7	0	3		6	4	13			7	2	11				53
4		3		0		3		5		8	4	1	5		2		31
5		1			0	3		5			4	2	3				18
6		8	3	7		32	6	19			9	2	13	1	9		109
7		20	1	2		3	7	11			5		10				59
8		30	3	2		20	14	41		1	18	5	34		8	1	177
9									0								0
10			2	2		2		2		0			1				9
11		5	39	8		14	2	15			4	1	13		1		102
12		2		1	17	1						0	4				25
13		29	2	1	1	9	7	34			29	7	109				228
14			1											1			2
15		1		2		8		4			3	1	2		2		23
16													1			0	1
T	1	119	53	31	18	109	59	177	0	9	102	25	228	2	23	1	957
%	0.1	12.4	5.5	3.2	1.9	11.4	6.2	18.5	0	0.9	10.7	2.6	23.8	0.2	2.4	0.1	100

I/D = 0.643   S/T = 0.240   Si/Ta = 0.361

TABLE 10

Phase One: OSIA Matrix, Class 1B, Lesson 7

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0			1		1		1			1		1				5
2	2	8	4	3		6	9	25			16	9	10				92
3		9	0			4	4	10			13	3	12				55
4				0						4	4						8
5		3			0		1	2			6	1	4				17
6		7	2			17	1	8			8	2	8		2		55
7		7				3	9	6			4	5	9		2		45
8	1	15	1			7	8	27		1	11	6	24		4		105
9									0								0
10			2				1	1		0			1				5
11	1	9	44	3		9	4	4			2		9			1	86
12		5			17	1		4			2	0	5				34
13	1	29	2	1		1	7	16			19	8	57				141
14														0			0
15						6	1	1							2		10
16													1			0	1
T	5	92	55	8	17	55	45	105	0	5	86	34	141	0	10	1	659
%	0.8	14.0	8.3	1.2	2.6	8.3	6.8	15.9	0	0.8	13.1	5.2	21.4	0	1.5	0.2	100

I/D = 0.863 S/T = 0.327 Si/Ta = 0.300

TABLE 11

Phase One: OSIA Matrix, Class 1B, Lesson 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0							1									1
2		19	4			7	26	16			11	15	31				129
3		10	1	1		5	6	8			12	2	16				61
4		1		0		1				3	3	1	1		1		11
5		2	1		0	1		3			5	3	6				21
6		6		2		23	3	11		2			14		11		79
7		22	2		1	3	28	13			6	5	14		1		95
8		17	1	1		15	7	19		1	9	3	17		4		94
9									0								0
10			2			2		1		0	1		1				7
11	1	2	45	3		8	3	5			3	1	7				78
12		4		1	19	1	3	2			1	0	15			1	47
13		45	5	1	1	4	19	12			20	16	77			1	201
14														0			0
15		1		2		9		3		1			1		0		17
16												1	1			0	2
T	1	129	61	11	21	79	95	94	0	7	78	47	201	0	17	2	843
%	0.1	15.3	7.2	1.3	2.5	9.4	11.3	11.2	0	0.8	9.3	5.6	23.8	0	2.0	0.2	100

I/D = 0.832 S/T = 0.269 Si/Ta = 0.353

TABLE 12

Phase One: Combined OSIA Matrix, Class 1B

Lessons 1, 2, 5, 7, and 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0	2		1		1		4			5		2				15
2	5	83	20	15	1	36	68	136			82	38	131		7		622
3		47	6	13		21	17	65			56	9	70		2		306
4		10	2	1	0	8	0	10		49	25	3	11	0	3	0	122
5		10	1	1	0	6	1	19			23	8	21				90
6		39	5	14		103	13	71		5	35	6	51	1	32	1	376
7		72	3	2	1	9	50	35			19	11	41		3		246
8	3	133		15		85	32	182		6	76	18	128		42	2	731
9									0								0
10		1	21	10	1	10	1	13		0	3		4				64
11	4	40	222	21	1	43		44			16	3	59		1	1	465
12		13		4	84	3	3	7			3	1	27			1	146
13	3	167	13	15	2	26	50	121			112	47	396				953
14			1											1			2
15		5	3	9		25	1	24		4	10	1	8		15		105
16				1								1	4			0	6
T	15	622	306	122	90	376	246	731	0	64	465	146	953	2	105	6	4249
%	0.4	14.6	7.2	2.9	2.1	8.8	5.8	17.2	0	1.5	10.9	3.4	22.4	0	2.5	0.1	100

I/D = 0.854   S/T = 0.269   Si/Ta = 0.335

TABLE 13

Phase Two: OSIA Matrix, Class 2A, Lesson 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		10	2	2			2	10			7		8		1	1	43
3		2	2			1	1	4			4		9		1		24
4				0				1		1	2	1	3		1		9
5					0								2				2
6						0		1			1		6		7		15
7		4					3	1			1		3		4		16
8		3	2		1	1	1	10		1			15		14		48
9									0								0
10		1								0			2				3
11		3	18	2		2	1	1			0		1				28
12				1	1							0					2
13		19		2		4	6	10			10	1	35		2	1	90
14														0			0
15		1		2		6	2	9		1	3		5		5	1	35
16						1		1					1			1	4
T	0	43	24	9	2	15	16	48	0	3	28	2	90	0	35	4	319
%	0	13.5	7.5	2.8	0.6	4.7	5.0	15.0	0	0.9	8.8	0.6	28.2	0	11.0	1.3	100

I/D = 0.987 S/T = 0.210 Si/Ta = 0.679

TABLE 14

Phase Two: OSIA Matrix, Class 2A, Lesson 5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		3	3	1		1	10	4			5		19				46
3		6	1			1	2	2			2		8		2		24
4		1		0			1				2		1				5
5					0										1		1
6		2	1	1		6	1	4					5		2		22
7		6				3	6	2			5	1	19		3		45
8		2				4		4		1	4		6		5		26
9									0								0
10			1							0							1
11		2	14	2		2	3	1			1		1				26
12					1							0					1
13		24	4	1		3	20	5			6		51			1	115
14														0			0
15						2	2	4			1		4		0		13
16													1			0	1
T	0	46	24	5	1	22	45	26	0	1	26	1	115	0	13	1	326
%	0	14.1	7.4	1.5	0.3	6.7	13.8	8.0	0	0.3	8.0	0.3	35.3	0	4.0	0.3	100

I/D = 0.817 S/T = 0.166 Si/Ta = 0.655

TABLE 15

Phase Two: OSIA Matrix, Class 2A, Lesson 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0					1											1
2		8	5			2	16	2			1		17				51
3		2	0	1		1	2	5			3	1	10				25
4				0						4	1		1				6
5					0	1					1		2			1	5
6		2	2			16		4		1	4		11		3		43
7		4	3	1		2	17	4		1	4	1	21		7		65
8		1	2			6	1	4			3	1	9				27
9									0								0
10			1	1		2				0			1		1		6
11	1	2	9	1		3	5	1			1		4		1		28
12					5		1					0					6
13		32	3	2		5	20	7			9	3	60		1		142
14														0			0
15						4	3				1		5		0		13
16													1			0	1
T	1	51	25	6	5	43	65	27	0	6	28	6	142	0	13	1	419
%	0.2	12.2	6.0	1.4	1.2	10.3	15.5	6.4	0	1.4	6.7	1.4	33.9	0	3.1	0.2	100

I/D = 0.652 S/T = 0.179 Si/Ta = 0.593

TABLE 16

Phase Two: Combined OSIA Matrix, Class 2A

Lessons 1, 5, 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0					1											1
2		21	10	3		3	28	16			13		44		1	1	140
3		10	3	1		3	5	11			9	1	27		3		73
4		1		0			1	1		5	5	1	5		1		20
5					0	1					1		4		1	1	8
6		4	3	1		22	1	9		1	5		22		12		80
7		14	3	1		5	26	7		1	10	2	43		14		126
8		6	4		1	11	2	18		2	7	1	30		19		101
9									0								0
10		1	2	1		2				0			3		1		10
11	1	7	41	5		7	9	3			2		6		1		82
12				1	7		1					0					9
13		75	7	5		12	46	22			25	4	146		3	2	347
14														0			0
15		1		2		12	7	13		1	5		14		5	1	61
16						1		1					3			1	6
T	1	140	73	20	8	80	126	101	0	10	82	9	347	0	61	6	1064
%	0.1	13.2	6.9	1.9	0.8	7.5	11.8	9.5	0	0.9	7.7	0.8	32.6	0	5.7	0.6	100

I/D = .788 S/T = 0.184 Si/Ta = 0.637

TABLE 17

Phase Two: OSIA Matrix, Class 2D, Lesson 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		4		3			4	7			5		21				44
3		2	0	3		4	1	5			6		9		1		31
4			1	0				1		10	3		2		3		20
5					0		2				1		2				5
6		2				3		1			1		3		4		14
7		2					3					2	13		1		21
8		1	2	2		3		10			2		27		12		59
9									0								0
10		3	6	1				2		0			1				13
11		1	19	1			1	1			0		5		2		30
12					5							0					5
13		29	3	8		2	10	24			11	3	90		2		182
14														0			0
15				2		2		7		3	1		9		3	1	28
16								1								0	1
T	0	44	31	20	5	14	21	59	0	13	30	5	182	0	28	1	453
%	0	9.7	6.8	4.4	1.1	3.1	4.6	13.0	0	2.9	6.6	1.1	40.2	0	6.2	0.2	100

I/D = 1.064 S/T = 0.247 Si/Ta = 0.872

TABLE 18

Phase Two: OSIA Matrix, Class 2D, Lesson 5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		4	1				7						17				29
3		1	0			1	2						2				6
4				0						1			3				4
5					0												0
6						8		3					6		1		18
7		1	2	1			4						20		1		29
8						2	1	0			1		5				9
9									0								0
10			1							0							1
11		1	2								0		1				4
12												0					0
13		22		3		5	15	5			3		132		1	1	187
14														0			0
15						2		1							0		3
16													1			0	1
T	0	29	6	4	0	18	29	9	0	1	4	0	187	0	3	1	291
%	0	10.0	2.1	1.4	0	6.2	10.0	3.1	0	0.3	1.4	0	64.3	0	1.0	0.3	100

I/D = 0.696 S/T = 0.053 Si/Ta = 1.910

TABLE 19

Phase Two: OSIA Matrix, Class 2D, Lesson 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		0	1				2	1					9				13
3		2	0				11				3		11				27
4				0			1				1		1				3
5					0	1					2		2				5
6						1	1						3				5
7			4				19				3	3	44				73
8			1			1	1	2			2		2				10
9									0								0
10										0							0
11			6	1			3				0		2				12
12					5		3					0	2				10
13		11	15	2		2	32	7			1	7	163			1	241
14														0			0
15															0		0
16													1			0	1
T	0	13	27	3	5	5	73	10	0	0	12	10	241	0	0	1	400
%	0	3.2	6.7	0.8	1.2	1.2	18.2	2.5	0	0	3.0	2.5	60.3	0	0	0.3	100

I/D = 0.545 S/T = 0.162 Si/Ta = 1.532

TABLE 20

Phase Two: Combined OSIA Matrix, Class 2D, Lessons 1, 5 and 10

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	T
1	0																0
2		8	2	3			13	8			5		47				87
3		5	0	3		5	14	[illegible]			9		22		1		64
4			1	0			1	1		11	4		6		3		27
5					0	1	2				3		4				10
6		2				12	1	4			1		12		5		37
7		3	6	1			26				3	5	77		2		123
8		1	3	2		6	2	12			5		35		12		78
9									0								0
10		3	7	1				2		0			1				14
11		2	27	2			4	1			0		8		2		46
12					10		3					0	2				15
13		62	18	13		9	57	36			15	10	385		3	2	610
14														0			0
15				2		4		8		3	1		9		3	1	31
16								1					2			0	3
T	0	86	64	27	10	37	123	78	0	14	46	15	610	0	31	3	1144
%	0	7.5	5.6	2.4	0.9	3.2	10.8	6.8	0	1.2	4.0	1.3	53.3	0	2.7	0.3	100

I/D = 0.786   S/T = 0.176   Si/Ta = 1.288

APPENDIX O

OBSERVED HIERARCHY OF INCREASINGLY DIFFICULT BEGINNING SKILLS

OBSERVED HIERARCHIES OF INCREASINGLY DIFFICULT BEGINNING SWIMMING AND DIVING SKILLS

During observational analysis of the videotapes of Phase One, attention was directed to individual progression through tasks of increasing difficulty. Unless the lower order skills had been mastered, individuals would not ordinarily be expected to be able to perform any given task in any one of the lists.

Hierarchy of Swimming Skills: Face Down Position

1. a) Enters water waist to chest deep but requires good footing and physical support from a person or solid object such as a handrail or gutter.

   b) Enters and walks about in waist to chest deep water without additional physical support.

   c) Enters and walks in water up to chin depth.

2. a) Washes own face, including eyes, nose and mouth, while standing in chest deep water with additional physical support.

   b) Washes as in 2a, standing, no additional support.

3. a) Submerges face, including eyes, nose and mouth momentarily (less than three seconds) while standing with additional physical support.

   b) Submerges as in 3a, standing, no additional support.

4. a) Submerges face for longer than three seconds while standing with additional support.

   b) Submerges as in 4a, standing, no additional support.

5. a) Removes feet from floor while face submerges momentarily (less than three seconds) while gaining additional support from another person or a fixed object.

   b) As in 5a, with a floating support.

   c) As in 5a, with no support other than the buoyancy of the water.

6. a) Removes feet from floor while face submerges longer than three seconds while gaining additional support from another person or a fixed object.

   b) As in 6a, with a floating support.

   c) As in 6a, with no support other than the buoyancy of the water. This task is a sustained free float. It appeared to be the single most critical task if progress towards learning to swim was to continue.

7. a) Uses fundamental stroking style, alternate or simultaneous arm action, face submerged, for period less than three seconds.

   b) Strokes as in 7a for longer than three seconds.

8. a) Enters deep water but required physical support, and will not submerge face.

   b) Submerges face in deep water with additional support.

   c) Grasps solid support while being towed or assisted in deep water, face submerged.

   d) Floats or swims short distances, face submerged.

   e) Moves about freely in deep water with present limits of non-stop endurance.

Hierarchy of Swimming Skills: Back Position

Most children displayed much more confident behavior face down as compared to the back position. For that reason, but not all, most children were reluctant to attempt back floating until they had been successful at a sustained front float, task 6c in the hierarchy for the face down position.

The list of tasks leading to swimming on the back should therefore begin with tasks 1a through 6c as shown in the previous list.

7. a) Attempts to lean backwards but retains support on feet.

   b) Assumes back position with firm support from another person or physical object.

c) Assumes back position with minimal firm support.

d) Assumes sustained back float position with minimal firm support.

e) Assumes sustained back float with floating support.

f) Assumes back float with support and removes support momentarily, less than three seconds.

g) Assumes sustained (more than three seconds) back float without support other than buoyancy.

8. a) Assumes back float, no additional support, strokes briefly, less than three seconds.

b) As in 8a, strokes longer than three seconds.

Hierarchy of Water Entry Skills

1. a) Enters water carefully, requires assistance.

b) Enters water carefully on own using stairs or ladder.

c) Enters water carefully over edge of tank.

2. a) Enters water carefully over edge of tank, maintaining contact with hands but beginning to resemble a jump entry with feet and legs.

b) From a sit or crouch, jumps gently or clearly slides into water removing hand contact before fully submerged.

3. a) Controlled jump from semi-crouch or standing.

b) Jumps in freely from stand.

4. a) Attempts hands-first entry from sit or crouch, feet enter before hands.

b) As in 4a, hands enter before feet, body bent at waist and knees.

c) As in 4a, hands enter before feet, body stretched at entry.

d) Hands-first entry from slight crouch or stand, body not fully extended at entry.

e) As in 4a, body fully extended at entry.